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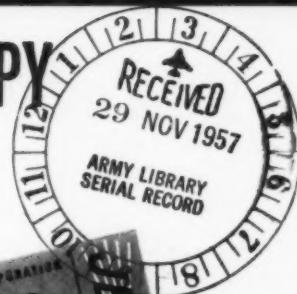
"Single manager" concept gets rough reception . . . Page 27

Traffic control book passed to manufacturers . . . Page 29

Jet atmosphere to power AF research vehicle . . . Page 38

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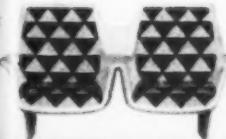


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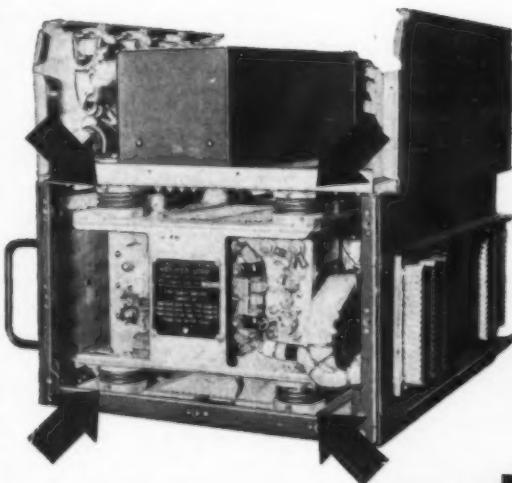
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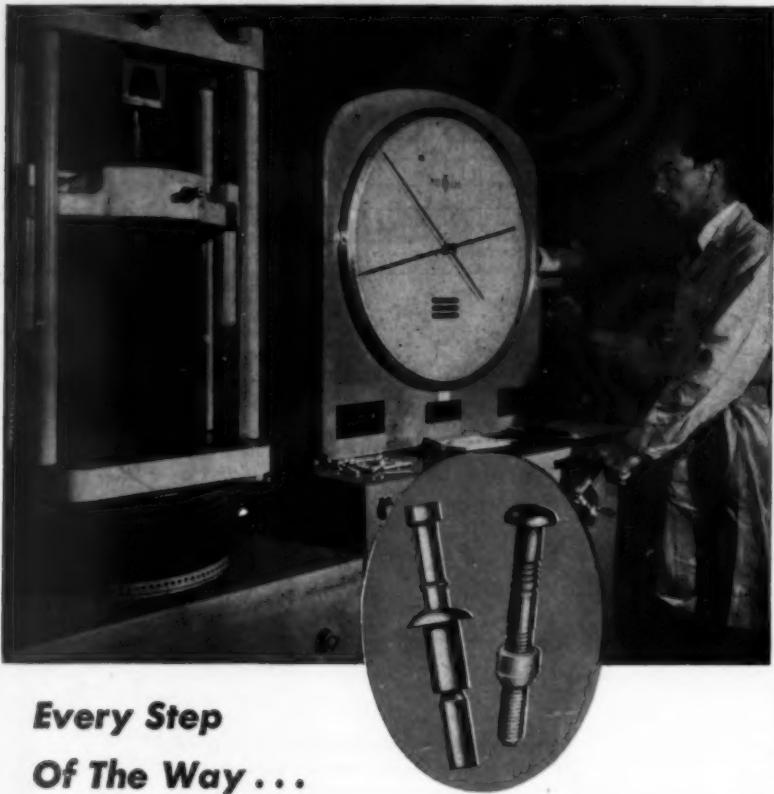
1. Increased operational reliability of Chance Vought's supersonic Crusader.
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Index designs accessories for missiles
Designing accessories for missiles presents
different problems than designing accessories
for aircraft, Bendix Aviation Corp. finds. Mis-
sile picture changes more rapidly. See page 40.

DECEMBER 2, 1957—VOL. 21, NO. 14

AMERICAN AVIATION

WORLD'S LARGEST AVIATION PUBLISHERS

ATC dilemma—progress or confusion

Is the new "system engineering process" for our airways taking us forward or backward? Sam Saint says the buck has merely been passed to manufacturers. See analysis page 29.

Texas' Big Four weather economy storm

Some trimmings were knocked off, but Convair, Bell, Chance Vought and Temco have retained their basic structures and have emerged in strong positions. See page 34.

Bonded strips for fatigue research

Douglas Aircraft Co. is trying out an innovative method of testing stress in structural components of DC-6 and DC-7 transports, using tiny strips of aluminum. See page 39.

Bendix designs accessories for missiles

Designing accessories for missiles presents different problems than designing accessories for aircraft, Bendix Aviation Corp. finds. Mis-
sile picture changes more rapidly. See page 40.

In this issue, a new feature . . . Designed to bring readers of AMERICAN AVIATION and the aircraft industry first-hand analysis of top Pentagon developments. What has happened since the Oct. 4 launching of Sputnik I to reshape a shrinking defense budget, set the stage for realignment of R&D management and, possibly, set off another inter-service outbreak over roles and missions? Read the answers in "Pentagon Outlook" by James J. Haggerty, Jr., on page 33.

Contents

TRENDS, DIGEST, BUSINESS

Airtrends	19
Digest	20
Transport Trends	51
Industry	52

INDUSTRY ROUNDUP

United orders 11 Boeing 720s, 10 more DC-8s	21
Industry, military oppose "single manager" concept	27
Russia shows big turboshaft copter	28
ATC buck is passed to manufacturers	29
Sputniks dull economy axe	33
Texas "Big Four" are in good shape	34
Dallas' new terminal (picture feature)	66

ENGINEERING

Upper atmosphere to power research vehicle	38
Douglas uses bonded strips in fatigue tests	39

ELECTRONICS

Missiles thrust dual role on accessory engineering	40
--	----

EQUIPMENT

Hydraulics meet tests of higher temperatures, speeds	42
--	----

TRANSPORT

How to run an airline—CAB style	44
Lockheed Electra nears first flight	44
CAB majority hails Trans-Caribbean award	46
AA takes issue with Capital subsidy request	47

DEPARTMENTS & FEATURES

Personal View	7
Letters	11
Spotlight	16
When & Where	24
People	59
West Coast Talk	61
Sidelights	63
Airline statistics	65
Technical Literature	69
Books	69
En Route	70

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How we think the CAB should act

THERE IS A GREAT DEAL of understandable confusion about the CAB's general fare investigation which was launched November 18.

The GFI definitely will not provide the relief needed now by the airlines. It will do well to be completed within a year, and it was never intended initially that this long, involved and complex rate procedure should be used as a vehicle for handling immediate problems.

It is coincidental that the GFI was launched at a time of growing financial crisis in the industry. Its origin 'way back, and its initial purpose was to establish criteria for rate-making, something that had never been done before by CAB. Call it a necessary evil, if you like, but at some point in CAB procedures a formula has been needed on which to determine reasonable fares. An earlier attempt which got off on the wrong foot was killed; the present GFI dates from early 1956.

As a separate and routine procedure, then, the GFI can be racked up as a good (or at least a necessary) thing. But to get it involved, as is currently being done, in immediate financial needs of the carriers, is to compound confusion.

There are doubts, of course, that the routine GFI is on the right track in its endeavors to establish a criteria for rate-making, but this again is a question that should be separated from today's airline financial crisis. Competent financial experts believe the CAB staff is following outmoded tactics and patterns and that the major question of how CAB is to establish rates should get full airing. But this would require a regular procedural hearing, of which GFI is a leading example.

What of the bigger problem now facing CAB and industry—the growing financial crisis?

Here is where we think the five members of the CAB should take a new look at their responsibilities.

We think they have become imbued with the idea that they are solely a court, a judicial body which has nothing to do with current problems until somebody files papers for a formal proceeding.

We are quite certain that Congress did not intend for CAB to sit only as a court. Congress gave a mandate to CAB to foster and develop and

stabilize the air transport system of the United States in the national interest.

Such a mandate calls for initiative and leadership. It calls for a broad approach. It does not call for donning judicial robes every time a current problem such as fares and financing is mentioned.

CAB Chairman Durfee has already shown that he can take the initiative in his determined position on control of airspace (versus the Military) and in international matters (versus the Department of State).

With the GFI proceeding on its year-long course in a search for criteria, we submit that a statesmanlike approach by CAB would be for Chairman Durfee to call a meeting of all airline presidents, leading aircraft manufacturers, government officials and some leading financial experts, to sit in an open forum.

We think the Chairman should open such a meeting with this sort of welcome: "Gentlemen, we are aware that the industry is facing a crisis of tremendous proportions. Our job as mandated by Congress is to help you, consistent with the national interest. We welcome your ideas and suggestions. Let's have them. We promise early and direct action on the basis of the facts presented."

Such a direct approach would mean an immediate uplift in both industry and financial circles.

Air transportation is a public utility but it is far different from any other. It is not a monopoly such as telephones and power. It is much more fast-moving than surface transport. It has a direct bearing on National Defense. It must be healthy. It cannot be allowed to deteriorate, nor can it be strangled because of a mass of technical procedural details out of step with the times.

Leadership attuned to the broad approach is vitally needed. If CAB fluffs this one, the alternative will be for the executive branch of Government to appoint an Air Transport Coordinator to operate above CAB in the broad national interest. But the latter step is unnecessary if CAB heeds the mandate of Congress and provides the management type of leadership so urgently needed today to restore confidence.

many ways and is a sign of airline growth. The 44,000 square feet of enclosed space will accommodate 145 trainees at a time. Exceptionally good designing went into the structures. Equipment and accommodations are absolutely top-flight. All in all it is a healthy development in the air transport industry and American can well be proud of its new ultra-modern plant.

Wayne W. Parrish

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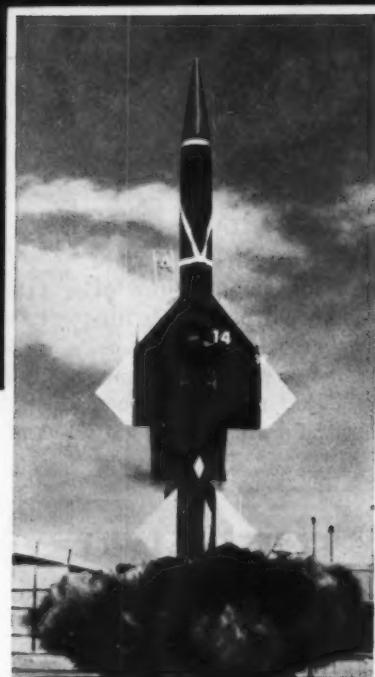
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LETTERS

Accessory producer's view

To the Editor:

We have just read with considerable interest your personal view editorial "Accessory Producers are Hard-Pressed" in the Oct. 21, 1957, issue (p. 13).

This is the first time that we have seen where someone in a responsible position has so clearly stated the position and problem of the accessory producer.

As an accessory manufacturer, along with others, we are faced with the problem of satisfying the highly complex and technical requirements of missile and airframe manufacturers.

In many instances our developments are such that we must bear the burden of development at our expense, and then it's a gamble. It's a gamble since in most cases, the end item is also under development and as a result the price that should be charged, generally means we won't see the business since some firms are practically willing to produce at ridiculously low prices, with the "hope" that a production order will result. After one or two of these attempts and no orders result, these firms begin to look elsewhere.

The cost for proposals alone can become a staggering expense, which in many instances cannot be recovered. Companies are not willing to pay for technical proposals or studies, since in past days of production, they were accustomed to receive such proposals at no charge. This because production orders were available, and such costs could be absorbed.

Stretchouts, stop-orders, etc., have also plagued the accessory producer in that these accessory manufacturers have been requested to hold the same price as originally quoted. This means in most cases unless price increases are allowed, there would be a loss for that order.

Accessory manufacturers in most instances do not, since they are basically sub-contractors, have up-to-date thinking on the program, and as a result, do not have the benefit of programming, future plans, etc. Many primes still give the feeling that production will be forthcoming only with the intent of trying to have the accessory producer hold the price. This is not generally done by management, but by over-zealous procurement policies.

A survey of accessory producers to the industry, we are certain, will reveal that a high percentage of such suppliers employ less than 150 employees and only deal in the aircraft industry. They have no industrial lines which can be used to balance their production work.

The result is absorption by large corporations, or going out of business and their combined developed technology lost. What's the answer?

The Government should take cognizance of the accessory producer and in their planning directives to the major suppliers, specifically make mention as to the treatment sub-contractors should receive. In an attempt to keep dollar volume high in many major plants, work usually given to sub-contractors and accessory producers is now being done in their own plants. Many times the majors acquire small accessory plants for such work.

Since the aircraft and missile business is basically defense, it would appear that we should recognize the fact that it's

important in case of emergency to have the manufacturing technologies spread around to as many accessory producers as possible. Otherwise, in case of such an emergency, it would be difficult to expand our production facilities to meet the need.

We are certain that there are many other aspects to this that could be aired, but not in a letter. The Government invites the major suppliers to the Pentagon for forums and briefings; it might not be a bad idea to have such a forum for the accessory producers.

Keep up the good work, and let the country know that it's the team that counts, if we are to succeed. *Julius Kendall, Vice President, Arkwin Industries, Inc., Westbury, N. Y.*

To the Editor:

I hope that some of the politicians and Pentagon bigwigs read and realized the seriousness of the situation put forth in your editorial "Accessory Producers are Hard-Pressed" which appeared in the Oct. 21, 1957, issue of *AMERICAN AVIATION* (p. 13).

Some of the major contractors' "do it ourselves" policy is costing our government millions of dollars every year. The services are not taking full advantage of the accessory producers' know-how and facilities. They will allow major contractors on CPFF-type [cost plus fixed fee] of contracts to spend millions of dollars on non-competitive basis trying to develop an article or technique in which they have no background or experience. After spending months or years stumbling over the same problems that the specialist did ten years ago, they finally come up with an acceptable article, and then through Pentagon drag, they will have rent-free facilities made available to them so that they might produce an article in competition to private capital.

If the accessory manufacturer makes an error in performing on a contract, whether it be in design or in price, he must bear the brunt of these losses. By the same token if he experiences a profit above normal on a program, he is forced into a redetermination program refunding profit that might help compensate for losses experienced on other contracts.

The accessory and component manufacturers would like to see more pressure brought upon the major primes insisting that some of the research and development on equipment items be let on a sub-contract basis. In the past in order to comply with the sub-contract requirements, the major contractors let out the sheet metal and structural fabrication which their facilities are primarily equipped to produce.

I would like to take this opportunity to commend you on your article portraying the position of the accessory manufacturers. *R. C. Hinman, Marketing Manager Aircraft and Electro Products, Western Gear Corp., Lynwood, Calif.*

Paraphrasing a compliment

To the Editor:

To paraphrase the opening lines of an article by William Beller which appeared in your November 4 issue (p. 42), "Rarely does a manufacturer receive such fine cooperation from the Engineering

Editor of a technical trade publication as did we in your article on the 'Seal-Lock' field attachable reusable fitting." *EDGAR S. PEIERLS, president, Resistoflex Corp., Roseland, N. J.*

Ode to Australian sausages

To the Editor:

As usual, I am reading *AMERICAN AVIATION* with great interest, particularly your "En Route" column.

I am glad to see that your reports on my country are straight from the shoulder, and apart from apologizing on behalf of my countrymen for the rude weather which got you away to such a bad start, I'll let the rest of your criticisms ride. However, I must say that after reading your September 23rd page, concerning breakfast aboard a TAA DC4 between Mt. Isa and Sydney, I experienced an acute attack of nostalgia.

I love your country, Wayne, and my wife does too, but there are times when our hearts really bleed for an Australian sausage.

Call them snags, bangers, missing links, bags of mystery or what you will, every red-blooded Aussie will fight to the death to preserve his breakfast sausage. None of your namby-pamby garden-party-sized slivers of meat and spices; the Australian sausage is something a hero can really get to grips with.

Roll on, freedom from quarantine, so I can import them by the plane load! *I. R. RICHARDSON, Civil Air Attaché, Australian Embassy, Washington, D. C.*

Editor's Note: By the way, just how do you get a grip on those crazy things?

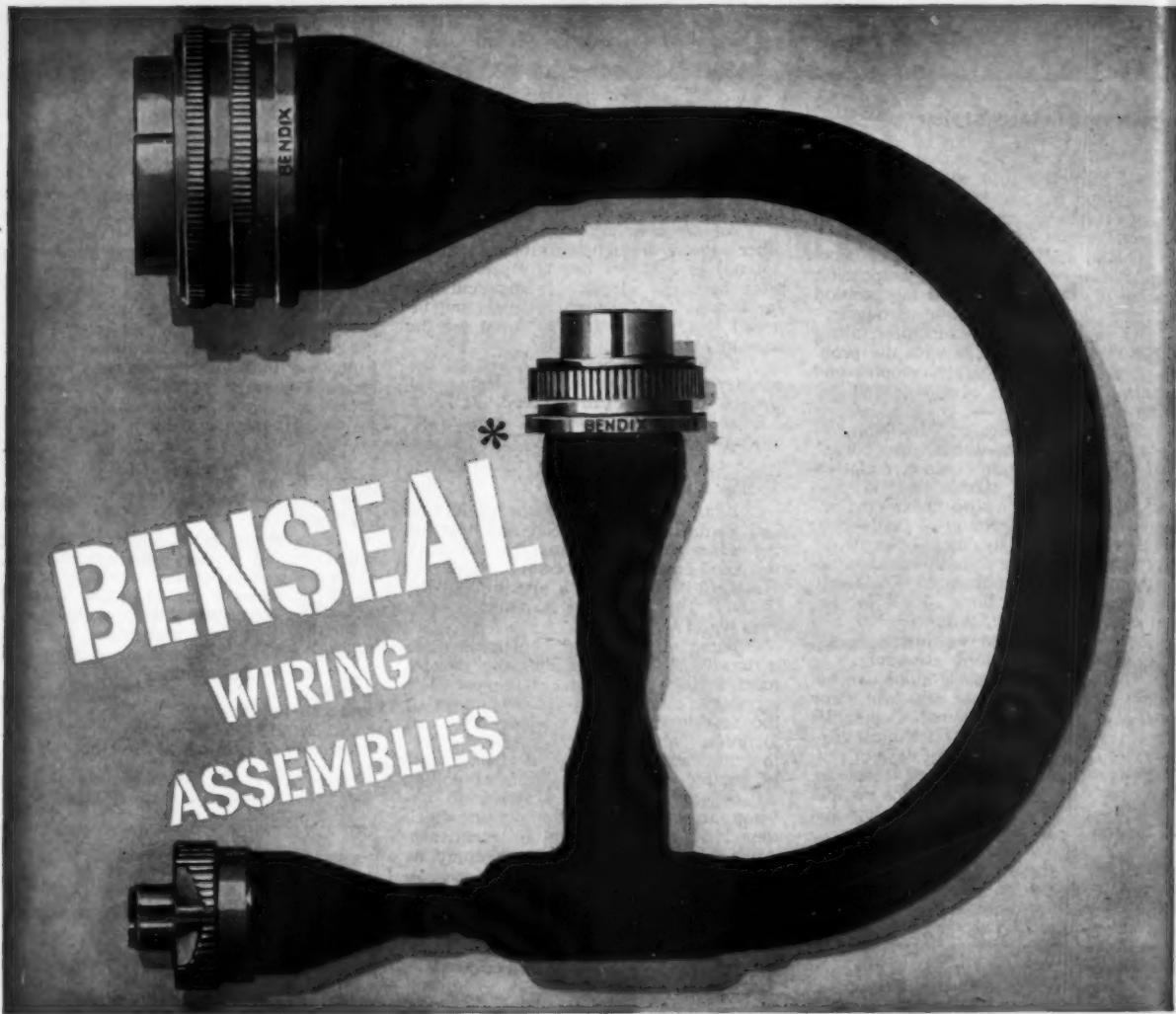


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Stator—(No. wires/No. phases)	4/2	4/2	4/2	4/2	4/2	4/2	4/2
Input voltage (to stator) (Volts)	16	11.8	11.8	11.8	11.8	18	26
Rotor current (stator open) (Milli-ampères)	14	29	9.2	46	52	11	38
Rotor power input (stator open) (Watts)	.03	.29	.06	.27	.2	.09	.05
Stator current (rotor open) (Milli-ampères)	13.5	49	15.3	78	91	12.6	12.4
Stator power input (rotor open) (Watts)	.05	.18	.05	.16	.17	.06	.08
Z _{ro}	139 +J 1134	352 +J 843	753 +J 2740	127 +J 550	72 +J 497	831 +J 2381	37 +J 194
Z _{zo}	254 +J 1160	75 +J 231	261 +J 1727	26.4 +J 149	21 +J 128	351 +J 1385	588 +J 2060
Rotor D.C. resistance per phase (Ohms)	70	240	450	75	55	375	22
Stator D.C. resistance per phase (Ohms)	175	44	165	16	14	160	206/408
Rotor output voltage per phase (stator excited) at maximum coupling (Volts)	14.9	19.7	20.3	19.5	20.7	21	7.45
Stator output voltage per phase (rotor excited) at maximum coupling (Volts)	15.3	11.8	11.8	12.6	11.8	17.8	26.2
Voltage gradient (stator) (Milli-volts/degree)	268	206	206	220	206	310	458
Phase shift (rotor to stator)	2.3°	14.6°	6.8°	6.3°	6.8°	7.28°	4.56°
Phase shift (stator to rotor)	8.1°	9.4°	10.6°	4.8°	6.5°	5.47°	4.6/9.8°
Null (residual voltage)	(Quadrature)	50	30	30	50	40	40
Total R.M.S. (Millivolts)		35	21	21	35	28	28
Fundamental (Millivolts)	12% of input voltage						
Angular accuracy	14% of input voltage	24° spread	24° spread	10° max.	20° spread	20° max.	45° max.
MECHANICAL CHARACTERISTICS							
Friction at +25°C (Gcm)	22	5	5	4	5	10	10
at -55°C (Gcm)	45	15	15	16	15	30	20
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1958

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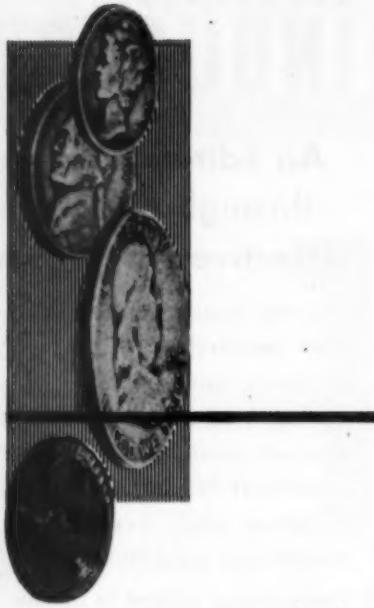
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SPOTLIGHT

Navy has no intention at this time of abandoning its Martin P6M four-jet flying boat program, despite reports to the contrary elsewhere. Twenty-four aircraft are on order, including six prototypes—two of which crashed during tests. Prototypes will continue to get Allison J71 engines, production copies will have Pratt & Whitney J75s. Third prototype is nearing rollout, and will have a new tail.

An English Electric Canberra bomber is reported flying at Farnborough with two wingtip engines—either rockets or ramjets. A Canberra with two Napier Scorpion rockets mounted under the fuselage set an altitude record of 70,000 ft. last summer. Speculation is that the newest configuration will try to beat that record.

Navy will not make a decision between the McDonnell F4H and the Chance Vought F8U-3 until both have been test flown—expected early next year. Reports from the Pentagon indicate both may be produced. F4H will have two GE J79s and the F8U-3 will get a single J75 with afterburner.

This may be a tipoff to expected performance: Air Force has tested a pilot's G-suit for the North American X-15 to altitudes of 250,000 ft.

Aerojet-General has begun first flight tests on its infrared proximity warning indicator installed in a company-owned DC-3. Following these tests, four instruments will be given trials by members of the Air Transport Assn.

Design competition is under way for a 40-pound, 1,000-cu.-in. airborne transistorized Tacan gear for supersonic aircraft. Stromberg-Carlson has delivered one unit to Navy for tests. Other competitors are Federal Telecommunication Labs and Collins Radio Co.

Met-Co-Aire expects to fly the prototype of its four-place utility plane by Jan. 15. Aircraft is powered by a Continental G10300 six-cylinder engine turning a constant-speed Hartzell prop. Plane will cruise at 145 mph for about 4½ hours, will cost \$8,950.

AC Spark Plug transmitter-receivers are being used in tests of air-to-ground public telephone service into Chicago and Detroit areas. Company has provided 20 units for airline and executive aircraft evaluation. Equipment weighs 38 lbs., operates at 450 mc FM. Minimum cost per call is \$1.50. This marks AC Spark Plug's first move into the civil airborne electronics market.

Convair B-58 Hustlers reportedly have piled up more hours of supersonic flight than all other aircraft in this country together. Hustler first flew Nov. 11, 1956.

At least one airline is reported reconciled to a power loss of 4% for reverse thrust and noise suppression on its jet airliners.

Convair will use Scotchweld process for adhesive bonding of spars and ribs to skins in its 880 jet transport program to create leakproof integral fuel tanks. Process, developed by Convair and Minnesota Mining & Manufacturing Co., was first used in the F-102A jet interceptor.

Flight Test Division of Curtiss-Wright's Wright Aeronautical Div. plans to start testing C-W's jet engine thrust reverser in the near future. Unit is installed in a modified F-84F. Extensive taxi tests will precede flight testing.

Grumman Aircraft Engineering Corp., which has not announced a missile project, has a group working in the missile field under a project engineer. Company reportedly is working on a pilotless reconnaissance aircraft.

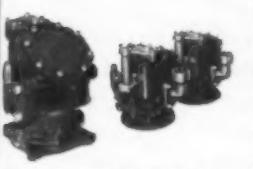
Washington National Airport is using a 300-million candle-power light to direct night traffic away from heavily populated areas. Light was developed by Westinghouse lamp division.

Wright Aeronautical dual-cycle engine is by no means a dead project. Development continues in spite of cancellation of the Republic F-103 contract. Probable application: an unidentified WS aircraft.



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AIRTRENDS

Future buying plans for Boeing B-52 in fiscal 1959 aren't in the proposed budget. Procurement of more of the big bombers is covered in a supplementary budget package. Decision on whether or not to buy will be made within the next two or three weeks at either National Security Council or Presidential level.

USAF's B-52 supplementary budget item is only one of a number being presented for fiscal 1959. Each service prepared its next budget within the original \$38-billion limitation, then added the overflow of key projects as supplemental packages. For all three services, these amount to \$3.5 billion.

Don't look for any provision for training planes in USAF's fiscal 1959 program. Unless present plans are scrapped, USAF won't buy trainers. Decision is said to result from a change in training concepts. Sign of the times is cancellation of about 100 Cessna T-37s in fiscal 1958 program.

Big question already being raised about creation of new Aircraft Nuclear Propulsion Office under Maj. Gen. D. J. Keirn: Is this no more than an empty gesture? ANPO will get no additional funds this year, and probably none in fiscal 1959 other than those already programmed.

Review by Air Research and Development Command of fiscal 1958 R&D program, including impact of delays caused by economy drive, was due to be completed by middle of last week. Report will be submitted to USAF Secretary James Douglas. Delays have caused a major problem and may leave USAF with unobligated funds at end of this fiscal year, according to informed sources.

Exceptions are now being granted to Defense Directive 7200.4 on pre-production procurement. First instance of relaxation, reported to have personal approval of Defense Secretary Neil McElroy, involves a \$12.5-million contract to Convair for long lead-time items for the B-58, as part of fiscal 1959 buying plans.

Here's background of the resignations of Rufe Amis and W. T. Amis as president and vice president, respectively, of Aero Design and Engineering Co., Oklahoma City (Aero Commander): George Pew, financial angel of Philadelphia, had aided the Amis* boys financially in building up the firm. What wasn't generally known was that Pew owns 81% of the stock and wanted more say in management. Frictions began to develop. When the showdown came, it was Pew who had his way.

Government's hold on various segments of aircraft industry makes them unattractive financial risks. This was the personal view of Edward Adams, Jr., Detroit banker, expressed at recent meeting of Aviation Distributors and Manufacturers Assn. Here's his analysis of the industry:

Airframe industry's reliance on military contracts has made it "captive" of government, with a federal ceiling on profits—yet with no guarantee of having any. Manufacturers are in position of having little or no company capital. A debt structure not consistent with good business practice puts them in the poor risk category.

Component manufacturers that have diversified and reduced defense business to 25%-30% of total are attractive to investors.

Lightplane builders are in a good investment category because of growth of business flying and lack of government interference.

Instrument-radio manufacturing is in a touchy position. Obsolescence is particularly high. Thus, industry must have some government help to pay high cost of R&D.

Distributors of aviation parts and supplies for the most part are well-financed, or could be, because they show reasonable profit.

DIGEST

ICBM not ultimate weapon, Irvine says; USAF exploring manned vehicles, space platforms to replace them

Air Force has active research programs aimed at development of manned ballistic vehicles and space platforms, Lt. Gen. C. S. Irvine, USAF Deputy Chief of Staff, Materiel, told the National Defense Transportation Assn. in Washington.

Gen. Irvine pointed out that the main AF effort was concentrated on defensive effectiveness.

"We are well along in the development of very large long-range radars for ballistic-missile early-warning detection and discrimination—all necessary for dispersing our forces and for controlled launching of anti-missile machines," he said.

He cited the USAF responsibility of defending the United States against air attack and of retaliating decisively and at once if "we are forced into a war."

"The effectiveness and success of our efforts are obvious: The Soviet Union has been deterred from starting a shooting war, the known result of which would be disastrous to themselves."

Air Force does not believe that ICBMs are ultimate weapons, Irvine said. Space weapons and vehicles will take their place in the "logical procession of weapon systems." He added, "without a doubt, the Air Force could develop and launch a space vehicle of

considerable size. Certain of our rockets and propulsion systems have the capability to place a satellite in orbit."

Discussing current and prospective weapon system programs, Irvine said the Douglas Genie air-to-air missile with an atomic warhead has been described as "the most significant advancement in air defense since radar."

He also cited the Bell Rascal and the North American GAM-77 air-to-surface missile being developed for firing from the B-52, which has considerably greater range than the Rascal and is in the same speed category.

In manned aircraft, he said, the WS-110A is capable of Mach 3 speeds and above 75,000-ft. altitudes. This would be a truly intercontinental bomber—able to make a roundtrip to target without refueling. Boeing and North American are competing for the contract and a decision is expected within a few weeks, he added.

The F-108, to be built by North American, will have greater speed, range and altitude capabilities than any interceptor now in production. Irvine said the F-108 will be effective against certain types of unmanned delivery vehicles in addition to manned bombers.

Other highlights of Gen. Irvine's talk:

An advanced version of the Boe-

ing Bomarc will have a solid booster rather than a liquid rocket. This will simplify logistics and minimize reaction time.

Martin Matadors are in tactical units and Snark intercontinental missiles will be employed in strategic units as soon as operational models are available. Snark will augment the manned bombers of Strategic Air Command.

Air Force IRBM Thor achieved a range of 2,645 miles in a recent test and, at its present known speed, the missile takes less than 20 minutes from launching to target over a 1,500-mile range.

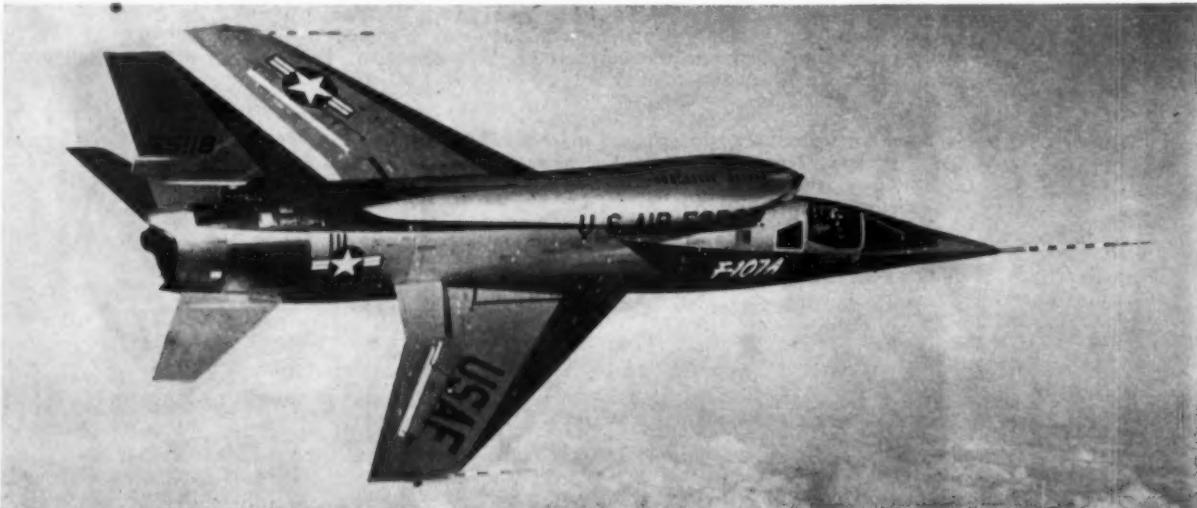
"We expect to have operational copies of Atlas ICBMs in near future and Titan relatively soon thereafter." Titan is lighter "and its range could be greater than Atlas."

Cargo planes must keep pace with missiles—Eaker

Cargo aircraft must keep pace with missile development if America is to have an effective overall defensive system, Lt. Gen. Ira C. Eaker said recently. The retired Air Force General, now a Douglas Aircraft Co. vice president, said that support of the IRBM program demands the most advanced type of air cargo carriers, combining speed, efficiency and range.

Gen. Eaker mentioned a system comparable to the government support of the Merchant Marine as a method of underwriting the cost of developing new cargo planes. General Eaker mentioned two possible means of maintaining cargo fleets: (1) military purchase of cargo aircraft and subsequent leasing to commercial carriers until time of emergency, and (2) airlift contracts to commercial airlines.

Mach 2 fighter goes to NACA for maximum tests



NORTH AMERICAN AVIATION'S F-107A single-engine jet fighter has been turned over to the National Advisory Committee for Aeronautics at Edwards AFB, Calif., for testing at high Mach numbers. Craft is powered by a Pratt & Whitney J75 engine and can exceed the speed of sound in a vertical climb. The overhead duct gives maximum efficiency to the 20,000-lbs. thrust engine.

Kaman H-43 wins Air Force contract



KAMAN has received a "multi-million-dollar" contract for production of H-43A and H-43B crash-rescue helicopters for the Air Force. The "A" version will have a Pratt & Whitney R1340 piston engine; "B" version (shown) has the Lycoming T53 turboshaft.

United orders 11 Boeing 720s and 10 more DC-8s at cost of \$100 million, bringing fleet total to 51

A \$100-million order for 11 new-type Boeing 720 medium-range jet transports and 10 more Douglas DC-8s, for 1960 delivery, has been placed by United Air Lines.

The 21 planes represent the "second stage" of UAL's jet equipment program, the first stage of which will commence in 1959 with 30 DC-8s previously ordered and costing \$175 million. Thus, UAL is now committed to buy 51 jets amounting to \$275 million.

President W. A. Patterson said the third stage "will be the acquisition of turbine-powered aircraft for our short-range segments which we are postponing until we have our long- and medium-range equipment program well advanced."

The long-range DC-8s will operate over segments ranging from 1,500 miles to the transcontinental nonstops and California-Hawaii. The 720 will enable UAL "to advance to the speed and efficiency of straight-jet aircraft for stage lengths from less than 400 miles to the Chicago-West Coast segments," Patterson said.

It had been reported for weeks that UAL's decision would be between the Boeing 717, Convair 880 and the turboprop Lockheed Electra. On Nov. 20, Boeing announced the 720, which it said replaced the 717, and on Nov. 22 UAL placed its order.

UAL thus becomes the second airline to order both Douglas and Boeing jets. Pan American World Airways was first.

UAL said arrangements are being

completed for an additional \$100 million in the form of credit from a group of banks headed by First National City Bank of New York. The company arranged financing amounting to \$150 million in 1955 when it placed its original order for 30 DC-8s.

Boeing and UAL said the 720 will be powered by a new, lighter-weight, higher-thrust version of the Pratt & Whitney J57 engine. It will cruise in excess of 600 mph and will carry 100 to 125 passengers, depending on configuration.

The maximum takeoff weight will be 203,000 lbs., compared with 265,000 lbs. for the DC-8. UAL said the 720 will be capable of operation into and out of any city presently served by DC-7s.

The 720 has an "improved airframe design," and dimensions are wing-span, 130 1/3 ft.; length, 134 1/2 ft.; height, 38 1/2 ft. It will carry 11,500 gals. of fuel and will lift a takeoff payload of 31,000 lbs. Cargo space totals 1,250 cu. ft.

Patterson said that "as we crystallize our plans for the equipment required to convert entirely to turbine aircraft and to serve our market, which we foresee doubling by 1965, more intermediate units will be added in the intervening years to phase out the remaining medium-range piston aircraft."

The 10 DC-8s, to be powered by J57 engines, will be delivered in the spring and early summer of 1960. The 720s will be delivered between April and September, 1960.

Mexican airline orders three Lockheed Electras

Three Lockheed Electra turboprops have been ordered by Aeronaves de Mexico S.A., marking the first purchase of the plane by a Latin American airline. The company said it will increase the order in the near future.

The order is not believed to have any effect on Aeronaves' plans to use Bristol Britannia turboprops. A Bristol spokesman pointed out that one Britannia has been delivered and the second will be received by the airline in December.

The Electras will be used on Aeronaves' Mexico-New Orleans route. Until their delivery, the route will be serviced with L-749A Constellations which are now being modified by Lockheed Aircraft Service.

AF cancels J91 project

Air Force has cancelled a contract with Pratt & Whitney Aircraft for development of the J91 turbojet engine that would have been used on an atom-powered aircraft. P&W, however, is continuing work on a nuclear engine under Atomic Energy Commission sponsorship at its Air Force-built nuclear engine research facility.

CAB grants Allegheny increased mail rates

CAB has fixed increased mail rates for Allegheny under which the carrier will get \$546,418 additional back pay and approximately \$400,000 more on an annual basis beginning July 1, 1957.

Proposed new "future" rate will raise annual mail pay for Allegheny to \$2,537,018, which is equivalent to the line's reported break-even need.

Varig picks Conway for 707s

The Rolls-Royce Conway has been selected by Varig, Brazilian airline, as the powerplant for three Boeing 707 Intercontinental jet transports it has on order for delivery starting in 1960.

The airline also announced that it has purchased Pan American World Airways' five remaining Convair 240s, giving it a fleet of 10 of the aircraft.

LAV orders six Fairchild Friendships

Linea Aeropostal Venezolana (LAV) has ordered six Fairchild F-27 Friendship turboprop aircraft with a short-term option for six more. LAV is the third South American carrier to order the 40-passenger twin-engine aircraft.

The LAV Friendships will be used to replace Douglas DC-3s and Martin 202 equipment now in service. First delivery is slated for November 1958.

Manufacturing—military

The Martin Co. received a tentative license from the Atomic Energy Commission to operate a nuclear experiment facility at Middle River, Md. Authorization followed a construction permit granted Martin in May to build two reactor cells for experiments relating to the Martin Power Reactor.

Kenneth Koyen resigned as Washington public relations manager for General Dynamics Corp. to become pubrel director of the British Travel Association in New York.

Ralph W. Kummer, former public relations and advertising director for Hiller Helicopters, has been named general manager of Bay Aviation Services Co., which has the fixed base operation at the Executive Aircraft Terminal, San Francisco International Airport.

North American Aviation produced a total of 1,948 T-28 trainers in an eight-year production that was on schedule throughout. The last T-28C was recently accepted by the Navy at Columbus.

Beech Aircraft Corp. has received a \$10,630,842 for 1,700-gal. external jettisonable fuel tanks for B-47 aircraft.

North American Aviation has entered into a technical assistance agreement with Construcciones Aeronáuticas Sociedad Anónima (CASA) of Spain supporting an overhaul program of at least 80 F-100Ds on duty with the USAF in Europe.

Financial

General Dynamics Corp. reports net profits of \$32,089,954 on sales of \$1,133,182,305 for the first nine months of the year. Profits were up 54% over the \$23,015,606 realized last year for the corresponding period. Sales were up 58% from \$715,505,688.

Pan American World Airways reports operating revenues for the third quarter were at a record high of \$90,954,000 compared with \$84,659,000 for the third quarter of 1956. Net income for the quarter was \$5,990,000, compared with \$6,708,000 a year ago.

Temco Aircraft Corp.'s sales for the first nine months of the year totaled \$89,739,000, up 47% over the \$61,196,000 for the comparable period last year. Net earnings this year were \$1,740,000, compared with \$2,127,000 last year.

Fairchild Engine & Airplane Corp. reports nine-month earnings of \$588,000 on sales of \$118,693,000, compared with earnings of \$1,374,000 on sales of \$107,455,000 for the same period last year. Backlog is \$177 million.

McDonnell Aircraft Corp. should realize earnings after taxes of about \$10 million for the fiscal year ending June 30, 1958, according to president J. S. McDonnell. This estimate is made

**Canadair announces new side-by-side jet trainer**

MOCKUP of Canadair's new CL-41 side-by-side basic jet trainer. Two prototypes are in production. Trainer will be powered by a single unidentified 2,000-lbs.-thrust turbojet. Company gave these specs: takeoff over 50-ft. obstacle, 1,700 ft.; landing distance, 1,100 ft.; stall speed, 62 knots; maximum speed, 400 knots; range, two hours at sea level, 800 nautical miles at altitude. In background is partial mockup of new CL-44 turboprop transport.

on the assumption there will be no more contract terminations and stretchouts, McDonnell said. Backlog now stands at about \$600 million.

United Aircraft Corp.'s consolidated net earnings for the first nine months of this year were up \$10,129,981 over the equivalent period of 1956, totaling \$38,300,349. Per share earnings were \$7.13 compared with recomputed earnings of \$5.34 a year ago. Backlog Sept. 30 was about \$1.85 billion compared with \$2.05 billion June 30.

Curtiss-Wright Corp.'s consolidated net earnings after taxes for the first nine months of the year were \$28,975,889 on sales of \$455,740,323. A year ago at the same time earnings were \$30,912,561 on sales of \$400,824,737. Backlog Sept. 30 stood at \$425,680,000 for the corporation and its subsidiaries.

Western Air Lines reports net income of \$2,385,860, or \$2.81 a share for the first nine months of 1957. Operating income for the third quarter totaled \$2,093,816.

Continental Air Lines reports net income after taxes of \$216,150 for the third quarter of 1957 and a net of \$259,566 for the nine months through Sept. 30. Last year the figures were \$130,951 and \$561,833 for the two periods respectively. Operating revenues for the nine months amounted to \$16,884,875, up from \$13,786,829 a year ago.

Grumman Aircraft Engineering Corp. reports net income for the first nine months of the year totaled \$4,883,705, after providing \$3,657,000 for taxes and renegotiation but including \$1,455,614 credit on contract adjustment. Net was equal to \$2.22 a share on sales of \$147,514,031. Last year at

the same time income was \$6,037,977 or \$2.74 a share on sales of \$140,405,243.

North American Aviation reports income of \$33,864,462 on sales of \$1,243,767,483 for the fiscal year ended Sept. 30. Last year's sales were \$913,981,913, resulting in income of \$28,760,962. Earnings per share for 1957 were \$4.22 compared with \$3.59 last year. Backlog at end of fiscal year was \$581,000,000, down from \$1,285,000,000. However, backlog will rise to \$918,000,000 when new orders are funded.

Transport

CAA awarded the largest electronics contract in its history, \$11,360,875, to Federal Telephone and Radio Co., division of International Telephone and Telegraph Co., for Vortac system ground beacons and test monitor and control equipment.

Continental Air Lines is switching its \$1 million a year advertising account from Gaylen E. Broyles Co., Denver, to the Chicago office of J. Walter Thompson Co. Transfer will be concluded next February.

Argemiro Machado, 60, president of Panair do Brasil, died Nov. 10 at Massachusetts General Hospital, Boston. Burial was in Rio de Janeiro.

Eastern Air Lines will lease three DC-7s from United Air Lines and six Constellations from TWA for operations during the winter season. The UAL planes will be used in first-class service between Chicago and Detroit and points south, while the Connies will be operated as 78-passenger aircoaches on the eastern seaboard. Planes will be retained by EAL until May, 1958.



The Boeing KC-135
Jet air tanker designed
for aerial refueling of
SAC's bombers and fighters

Flyweight Jockey for a High-flying Boom...

The Boeing KC-135 jet tanker is the USAF's first production plane capable of in-flight refueling of supersonic bombers and fighters at jet speeds and altitudes.

To maneuver the mighty tanker's refueling boom with pin-point accuracy, Boeing development engineers designed a lightweight, pivoting "Ruddevator" . . . a 30 x 60 inch honeycomb sandwich control surface.

A critical problem in the design of the uniquely efficient sandwich structure was the selection of a structural adhesive to splice the several sections of internal core as well as to bond the skins to the core. Obviously, the adhesive would have to withstand enormous operational punishment including severe sonic buffeting.

The adhesive selected for this crucial task: Narmtape® 102 . . . formulated specifically with non-brittle elastomeric constituents to provide unmatched fatigue resistance under highest stress and vibration. The KC-135 Ruddevators' more than 200 hours of trouble-free service life are further testimonial to the ability of Narmco adhesives to perform under rugged operational requirements.

Facing a structural bonding problem? Let Narmco's outstanding family of sandwich and metal-to-metal adhesives point the way to an economical, performance-test solution!



Write today for specific performance and fabrication data on NARMCO structural adhesives. Narmco technical field representatives throughout the United States and Canada can assist in solving your structural design problems quickly, efficiently, economically.

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FROM AN ORIGINAL PAINTING FOR CECO BY R. T. HANDVILLE

Contributing . . . to superb performance

Convair's F-102A Delta Dagger is powered by a Pratt & Whitney Aircraft J-57 turbojet with *afterburner fuel control* engineered and built by Chandler-Evans.

Products, too, are "known by the company they keep", and CECO is proud to be airborne with many of the latest and finest military and commercial aircraft.

Typical CECO fuel system components: Model MC-11 is one of a new series of complete fuel control systems for small gas turbines. These controls incorporate integral fuel pumps, yet one version actually weighs less than eight pounds. Model 9504 Fuel Pump, by-pass equipped, three-element pump, supplies fuel at predetermined pressures and quantities to both main and afterburner fuel controls.



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CECO
SYSTEMS CONTROLS

WHEN—WHERE

DECEMBER

Symposium on high temperature strain gauges, Aeronautical Structures Lab., Naval Air Materiel Center, Philadelphia, Dec. 4-5.

American Rocket Society eastern regional student conference, Polytechnic Institute of Brooklyn Chapter, Hotel Statler, New York, Dec. 6-7.

Eastern joint computer conference and exhibition, IRE, ACM, AIEE, Sheraton-Park Hotel, Washington, D.C., Dec. 9-13.

Air Traffic Control Symposium, Franklin Institute Laboratories, Philadelphia, Dec. 16-18.

Wright Brothers Lecture, IAS, Dept. of Commerce Auditorium, and Wright Day Dinner, Sheraton-Park Hotel, Washington, D.C., Dec. 17.

JANUARY

National Symposium on electronics reliability and quality control, Hotel Statler, Washington, D.C., Jan. 6-8.

Annual meeting and engineering display, SAE, Sheraton-Cadillac and Statler Hotels, Detroit, Jan. 13-17.

Yankee Instrument Fair & Symposium, Instrument Society of America, Hotel Bradford, Boston, Jan. 14-15.

Aviation Institute for Commercial Carriers & Business Pilots, University of Calif., Los Angeles, Jan. 20-Feb. 7.

Miami International Air Show and Exposition, Sertoma Club, Master Field, Opa-Locka, Fla., Jan. 22-26.

IAS annual meeting, Sheraton-Astor Hotel, New York, Jan. 27-31.

American Astronautical Society annual meeting, New York City, Jan. 29-31.

Southern California Meter Assn., annual instrument short course, Los Angeles Harbor College, Wilmington, Calif., Jan. 30-31.

ASEE College-Industry conference, University of Michigan, Ann Arbor, Mich., Jan. 30-31.

MARCH

ASME Gas Turbine Power Div., conference and exhibit, Shoreham Hotel, Washington, D.C., March 2-6.

Nuclear Congress, International Amphitheater, Chicago, March 16-22.

ARS-ASME joint aviation conference, Statler-Hilton Hotel, Dallas, March 17-20.

IRE national convention and radio engineering show, Waldorf-Astoria Hotel, New York Coliseum, March 24-27.

International Instrument Show, Caxton Hall, Westminster, London, March 24-29.

APRIL

ASME div. of instruments and regulators conference, University of Delaware, Newark, Del., April 1-3.

ASME maintenance and plant engineering conference, Penn-Sheraton Hotel, Pittsburgh, Pa., April 14-15.

ASME design engineering conference, International Amphitheater, Chicago, April 14-17.

ASME-AWS metals engineering divisions conference, Statler Hotel, St. Louis, April 15-17.

Institute of Environmental Engineers, annual technical meeting, New Yorker Hotel, New York, April 17-18.

AIEE, IRE, EIA, WCEMA, electronic components conference, Ambassador Hotel, Los Angeles, April 22-24.

*Jet-Age Strategy
demands
Jet-Speed Pumps*

**Propulsion Research
REFUELING PUMPS**

**provide dependable
high-speed fuel flow**

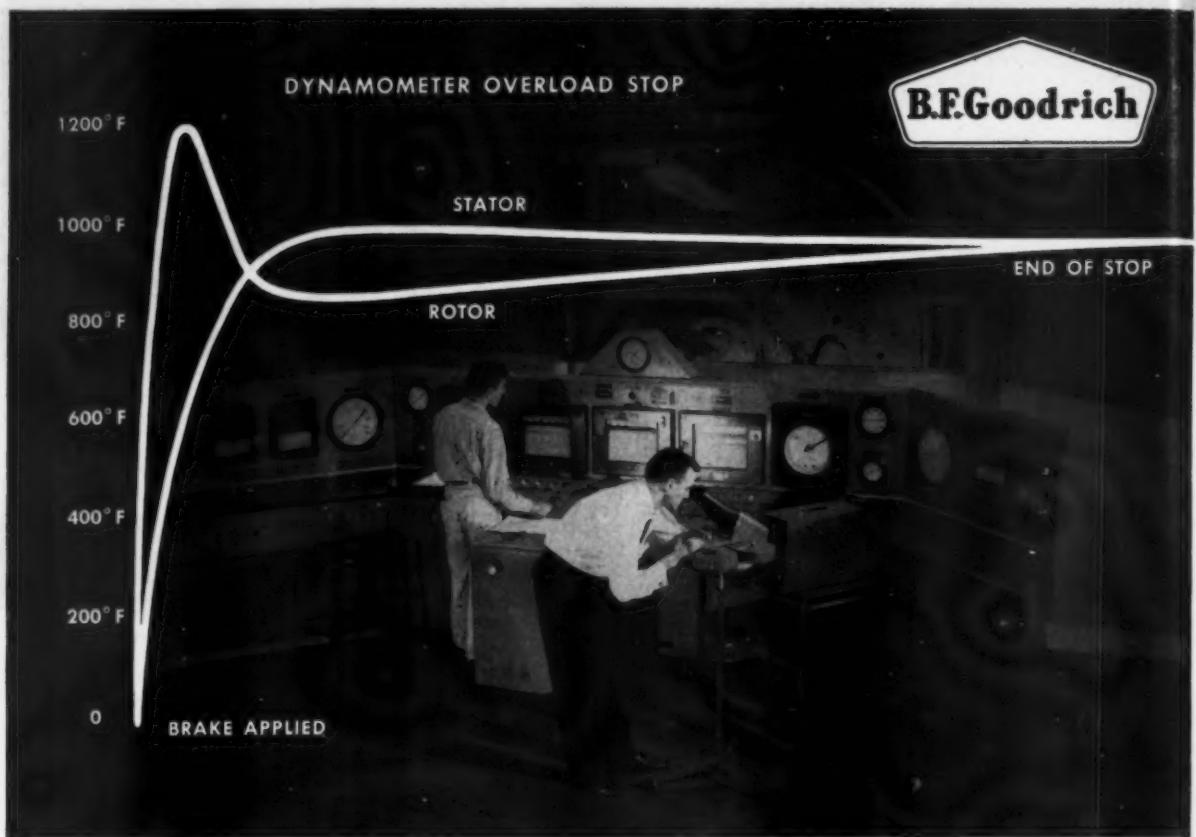
Today, in-flight refueling is the key to America's global air defense — saves time that can speed a plane to any possible target with the Sunday punch of retaliation, in the event of sneak attack. Where seconds can make the difference, America's fighting aircraft are being air-refueled in increasing numbers. At the Propulsion Research Division of Curtiss-Wright, highly trained and experienced specialists are developing a family of compact, high performance pump assemblies which can transfer fuel from tanker to striker aircraft at extremely high rates of speed. Units are available to meet a variety of fuel flow and pressure requirements. Refueling pumps are a good example of the contribution of the Propulsion Research Division to a wide variety of accessory power requirements for our air forces, and for industry.

PROPELLION RESEARCH DIVISION

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CORPORATION • SANTA MONICA, CALIFORNIA





THERMAL BALANCE makes B.F. Goodrich Disk Brakes stop faster, smoother. *Here's graphic proof!*

Study the chart above and you will see how built-in Thermal Balance enables the new B.F. Goodrich Disk Brake to operate more efficiently—with fewer "hot spots," less "chatter."

Thermal Balance—a function of proper design—is equalized heat distribution throughout the metal parts of the brake in proportion to their respective capacities. This concept is the result of BFG pioneering the use of electrical analog computers in brake detail design.

Because of the B.F. Goodrich Disk Brake's Thermal Balance, heat energy spreads rapidly and uniformly from the friction surfaces to the rotor and stator masses, eliminating warpage and uneven wear caused by hot spots. This insures longer brake life.

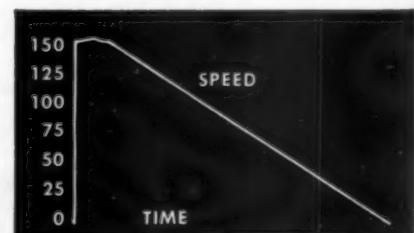
These benefits of thermally balanced design are reasons why aircraft manufacturers and airlines are choosing the B.F. Goodrich Disk Brake for their advanced planes. Extensive tests in the laboratory and in actual flight operations have proved that this new brake has a more efficient heat sink mass—a higher capacity for fast, safe stops—than any other brake on the market today.

To incorporate the advantages of Thermal Balance in your braking system, contact B.F. Goodrich Aviation Products.

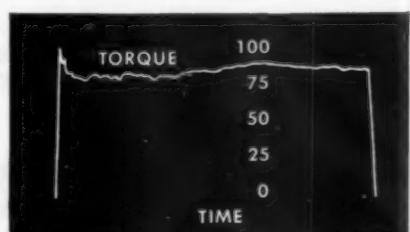
B.F. Goodrich Aviation Products

a division of The B. F. Goodrich Company, Akron, Ohio

B.F. Goodrich



Thermal Balance produces this *constant* ratio of speed to time. "Straight line" stop shows smooth, uniform deceleration.



Constant torque during stop proves that BFG Disk Brakes eliminate damaging vibrations.

Defense takes over . . .

But industry and military observers are openly critical of 'single manager' concept for advanced R&D

by Henry T. Simmons

THE ADMINISTRATION'S PLAN to establish a "single manager" for advanced missile and satellite projects within the Office of the Secretary of Defense has aroused swift and strong disapproval from industry and military quarters.

The step was first announced by President Eisenhower in a speech last month, then elaborated by Defense Secretary Neil McElroy in a press conference. It would give the Office of the Secretary of Defense a significantly important operating responsibility in the area of research and development—its first such responsibility in the 10 years of its existence.

Avowed objective of the plan is to speed the nation's progress in the development of so-called "upstream" projects by wiping out duplication and consolidating all effort on specific projects under the control of a single official. By withholding the assignment of operational missions to the services until the new weapons are in an advanced state of development, it is hoped to avoid much of the inter-service rivalry generated in the past.

Aircraft industry officials as well as high-ranking military officials see little in the "single manager" concept to recommend it, and much to warrant its rejection.

Commented one industry official: "The Defense Department is just creating a new boss and a staff for him on top of all the existing chiefs in the military structure. There's bound to be a delay in setting up the new boss, and the extra complexity will produce further delays in the operation of the system."

Military reaction was somewhat more caustic. An Air Force spokesman said the creation of the new job in OSD will introduce "unimaginable" complexity in the USAF programs to develop advanced weapons and explore space flight technology. Some of this work is being performed by the Ballistic Missile Division under Maj. Gen. Bernard Schriever; presumably these portions of BMD's activity will be

turned over to the new single manager while the USAF will continue to provide administrative and housekeeping support.

"This new approach is just the opposite of good practice in industry," the USAF official declared. "Charlie Wilson once said General Motors was too big to be managed by a single individual so it had to be decentralized; the same thing applies here, but we are going in the opposite direction."

An important element of much of the military reaction to the single manager is the fact that it brings the policy-making level of the Defense Department into the operating sphere for the first time. The services have always feared OSD tendencies in this direction, partly because they felt that an enlarged OSD would restrict their own independence and partly because of the

traditional military insistence upon a policy of making authority go hand-in-hand with responsibility.

The requirement that authority and responsibility be placed in the same official is probably the principal military argument against recurring proposals to establish a "fourth service of supply," such as was recommended by the second Hoover Commission. Just as a theater commander must have complete control of his logistics support, the services declared, so the services themselves should have control over their own internal supply systems.

By analogy, the same reasoning applies to control over research and development activities. The military service which might ultimately be assigned responsibility for placing a new weapon in operation should have authority over the development of that

Atomic aircraft project gets 'single manager'

The Administration has concentrated all responsibility for the development of a nuclear aircraft in the hands of Maj. Gen. D. J. Keirn, USAF, in an effort to expedite research and development of the atomic-powered airplane.

As "single manager" for the nuclear aircraft, Keirn will head the newly-established Aircraft Nuclear Propulsion Office of the Atomic Energy Commission. His office will have executive control over the entire program and may call upon "subordinate organizations" for assistance in specific areas.

Keirn's new grant of authority will eliminate many of the bureaucratic roadblocks which have previously hampered administration of the WS-125 nuclear aircraft project. One spokesman likened Keirn's enhanced position as similar to that given Rear Adm. H. G. Rickover in developing the Navy's atomic submarines.

It is not clear whether the Ad-

ministration will accompany the organizational shift with additional support for the nuclear aircraft. The program was re-aligned last spring to concentrate effort on propulsion but there has been renewed congressional sentiment for a crash program, including such "shortcuts" as the installation of nuclear power in an existing airframe like the KC-135 tanker.

Under the new organizational arrangement, the Atomic Energy Commission will continue to handle research on the reactor for the atomic airplane, while the Air Force will work on the airframe, engines and other components. Gen. Keirn will continue as Assistant Deputy Chief of Staff (USAF) for Nuclear Development as well as chief of AEC's Aircraft Reactors Branch.

The Aircraft Nuclear Propulsion Office will draw upon the Navy for personnel as well as the Air Force and AEC. It will be located in AEC headquarters in Washington, D. C.

weapon to assure its integration into existing weapon systems.

The new single manager concept breaches this time-honored military tradition, however, and it remains to be seen whether the idea will gain headway within the Defense Dept.

One authoritative Pentagon official thinks it will not. He regards the step as an emergency action aimed primarily at convincing the American public that the present Administration is doing something about the nation's startling lag behind Russia in developing ballistic missiles and major satellite projects.

"We're on the spot and we have to do something," he explained. "But don't expect this to develop into a fourth service of supply or anything like that. The military services just can't manage to carry out their missions under that kind of a set-up, and there is no disposition on the part of the Administration to ram it down their throats."

This official also takes a gloomy view about any potential the new concept might have with respect to eliminating inter-service rivalry. Said he: "This approach won't ameliorate inter-service strife and squabbling one bit. Whether we or the military services develop a new weapon, the services will still be competing just as hard to get the operational assignment as they do under the present system."

It was not clear at this writing just how the new single manager's office would be organized or how he would receive his facilities support. There was some feeling that the new OSD official would be assigned whole development facilities by outright transfer

from the services, but most observers felt that any facilities turned over to the single manager would remain under the administrative control of the individual services.

In this connection, there were already signs of a sharp controversy in the making as to whether the new official would be supported by private industry or by government arsenal. The Army would be happy to receive a mission to support the new official with its Redstone Arsenal, but industry representatives were quick to point out that Redstone has just been assigned a satellite responsibility and that it may also be directed to put the Jupiter IRBM into production. These new tasks would find it "over-loaded" and obviously not able to handle any new assignments, industry men conclude.

Defense Secretary McElroy had not chosen his single manager at this writing, but he did say he hoped to name the official this month, at the latest.

USAF orders stretchout in B-52 production

Air Force has ordered a new stretchout in B-52 production at Boeing Airplane Co.'s Seattle Division. The step apparently was made to ease the expenditure rate during the current fiscal year.

Boeing is expected to complete B-52 work at Seattle in February 1959 instead of November 1958. Production at the Wichita Division of Boeing is not affected. Seattle's rate will drop from seven to five B-52s a month while Wichita will continue at a rate of eight B-52s a month.

Reds reveal giant new twin-turboshaft helicopter

RUSSIANS are claiming new records for their MI-6 twin-turboshaft helicopter, which they say will carry 70-80 passengers. Reds say copter lifted 26,400 lbs. to an altitude of more than 7,800 ft. Copter was designed by M. L. Mil.



Convair gets \$12.5-million contract for B-58 items

Convair has received a \$12.5-million contract to implement production of long lead-time items for the first inventory quantity of B-58 supersonic bombers. About 95 aircraft are involved and will be fully financed in fiscal 1959.

The contract is beyond the 30 B-58s ordered for the test program. It is the first announcement for the fiscal 1958 buying program. B-58 tests have entered Phase II.

Air Force announces new prop for C-130B

An advanced version of Hamilton Standard's Hydromatic propeller will be used in the "B" version of the Lockheed C-130 Hercules, it has been announced by the Air Force. The new prop is said to be tailored to C-130 requirements and incorporates new safety and performance features.

C-130A models use Aeroproducts propellers in conjunction with the Allison T56 powerplants.

The Hamilton Standard prop has four solid aluminum blades and features an independent source of oil with its own pumping system to provide hydraulic power for pitch changing. Diameter is 13½ ft.

Hamilton Standard officials said the new propeller "has behind it a background of more than \$28.5 million spent in propeller development directly associated with turbine engine applications." More than 11,000 hours of flight test experience have been accumulated.

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Air traffic control dilemma—progress or confusion?

by Sam Saint

Under White House direction, with full congressional support, a "system engineering process" of solving air traffic problems has replaced the Special Committees of the Radio Technical Commission for Aeronautics, the Working Groups of the Air Coordinating Committee and the Air Navigation and Development Board.

In one year, the "system engineering process" under Presidential aide Edward P. Curtis found no answers to some of the toughest questions blocking solution of the air traffic dilemma. Now, under strong man Elwood R. (Pete) Quesada, manufacturers are being asked to solve in eight weeks problems that the Curtis team could not solve in a year.

Question: Is the new "system engineering process" taking us forward or backward?

"MODERNIZATION (of the nation's aviation facilities) should come through the use of sound system engineering principles." So said the Curtis Systems Engineering Team in its report, "A Plan for Modernization of the National System of Aviation Facilities."

In turning this report over to Elwood R. (Pete) Quesada and the new Airways Modernization Board, the Curtis team claimed to "have approximated the first two steps in the system engineering process—defining the problem and synthesizing the solutions." The recommendations of the team suggest an "initial configuration of a modern aviation facilities system"

The Curtis team's recommendations are the end product of a new method of solving headaches of the air age. Gone is the old-fashioned committee where men and agencies of differing views hammered away at each other across the walnut table. Under Edward P. Curtis, the White House team leaped into the driver's seat.

With blinders to prevent distraction by certain realities of life, it has turned the parade down a road of its own choosing. The tried and proven Special Committees of RTCA and the hard-working Working Groups of ACC have been left lying in the dust—with even the dignity of a proper burial.

The new technique is simple in the extreme. A small team of "experts" calls in the interested agencies separately, one at a time. Military, civil, private, commercial, controllers, pilots and manufacturers, each have their individual day before the all-powerful team.

The procedure is dignified and smooth. No bitter arguments between the private plane operators and the airline interests. No acrimonious debates between military and civil. No tears, as were seen on one occasion in the famous SC-31 Committee of RTCA. Arguments are presented, but the rebuttal is not heard. Those who rebut are not there to rebut. Next Tuesday is their day on the calendar.

After hearing the various agencies separately, the team retires behind closed doors to arrive at the vital decisions that presumably will "modern-

ize" our airway facilities. This method of keeping diverse interests from locking horns across the conference table gives the immediate illusion of progress, but the illusion fades under close scrutiny.

The new "system engineering process" of "modernizing" the airways has now moved into high gear. Congress has established the Airways Modernization Board to carry on where Curtis left off. Under Quesada, the AMB has asked some 40 electronic manufacturers to submit proposed equipment solutions of the ATC problem.

The manufacturers are to use the New York control area and "the traffic which will exist there after 1963" as the sample problem to be solved. They are asked to bid on a trial model of ATC equipment to include "as a minimum, all of the equipment required for two high-density civil terminals, one private terminal and one high-density military terminal. It shall be capable of demonstrating and exercising every function that will occur in the entire geographical problem area."

The AMB instruction to potential bidders contains a staggering array of complications to be considered. Interested manufacturers have been given eight weeks in which to submit their proposals. The deadline of Nov. 30 will have passed as this goes to press.

The short eight-weeks deadline given the manufacturers to submit their specific solutions carries an important implication. Clearly the AMB thinks the Curtis Systems Engineering Team has indeed accomplished the first two steps of "defining the problem and synthesizing the solutions." The language of the AMB instruction to bidders implies that little remains except to choose the best electronic hardware to implement the Curtis team's recommendations.

It would seem an appropriate time to examine the Curtis system recommendations. Specifically what solutions have been "synthesized" and tossed to the manufacturers? Has the problem actually been defined? The AMB is about to explode into major action. Maybe we should look to see which

way the missile is pointed before they light the fuse.

AMB has told the manufacturers that the Curtis team's technical report is to "serve as a guide for both the operational and technical aspects of the programming." Some latitude is given to "permit (the electronic) industry to exercise a maximum of ingenuity." But the last sentence of the lengthy AMB instruction says, "No new concepts are required"

Space in these pages will not permit analysis of such questions as: whether the Curtis team's recommendation for precise paths "reserved for interceptor climb and descent" will meet military requirements; whether "ribbons of controlled airspace" can be defined in any practical way for the un-equipped private flyer; and whether airspace can be used efficiently so long as the human controller is forced to remain the "decision-making element of the system."

Discussion here will be limited to three of the most basic questions in any traffic control system, whether on the ground or in the air. These are: (1) What sort of flow-control system will prevent paralyzing traffic jams? (2) How will flights be kept from clobbering each other in the crowded sky? (3) How will routes fit together in the complex, multiple-airport terminal areas?

In the Curtis Systems Engineering Team's report the controversial term "Flow Control" is studiously avoided. The subject is, nevertheless, introduced on page 39 without benefit of special heading. Flow control is made an integral part of the method of preventing collision.

In summing up one phase of the collision-prevention problem the report states in capital letters: "We believe that prearrangement of en route flights, in contrast to occasional intervention . . . will remain the basic method of collision prevention." The next paragraph introduces the flow-control ques-

An exclusive analysis

The decisions of today that will shape U.S. airways facilities of tomorrow are momentous. Dollar expenditures will run into hundreds of millions, eventually billions. The right answers are a must . . . now.

But are the answers proposed by the Curtis team right? Few are qualified in the intricacies of ATC matters to say. One of these few, contributing editor Sam Saint, takes sharp issue with the plan of action. As a current command pilot with a major airline and a recognized U.S. authority with unparalleled experience in the field, AMERICAN AVIATION feels Sam Saint should have every freedom to express his views. Read here what he has to say.

tion with this offhand sentence: "A word about the equity of prearrangement seems necessary." Next comes several seemingly contradictory statements on how traffic flow is to be "pre-arranged." Then this ambiguous summary of what seems to have been an annoying subject:

"We make a little more progress toward definiteness by adopting—as a matter of convenience rather than of strictly logical equity—the rule that when two pilots have asked for the use of a particular part of the airspace little weight is to be given, in deciding between them, to the nature of their errands or the number of passengers each one is carrying, while much weight is to be given to the time-order in which they arrive and ask for entry. However, we cannot quite concede that only this order should be considered, for this would imply a right of the first arrival at the table to eat the whole roast while the later guests sit by and starve."

The question of what will happen when an overload of traffic hits a terminal area is, of course, side-stepped completely. Where will pilots "arrive and ask for entry"? Will they be entering a Black Friday traffic jam at the edge of the saturated terminal area before their request is considered? Or will they be filing a flight plan at an operations counter 2,500 miles away asking "for entry"?

In the former case there is no way of preventing the disastrous logjam. In the latter case, if entry requests are granted in the order filed, dispatchers, military operations officers and pilots will have lost their right to decide which flight will operate and which will cancel. The longhaul flight, scheduled hours in advance, will have automatic priority over the short flight set up without advance notice.

Admits "no solution"

The Curtis team admits to having no solution when it continues with these words: "What actually happens, of course, is that detailed rules are adopted for the use of airspace and it is then made available—usually on a first-come-first-served basis—to every vehicle whose pilot is able and willing to follow the rules . . . The rules must be reasonable, observable, and enforceable. And they should be adopted deliberately, after debate, not suddenly and arbitrarily."

The foregoing statement plainly passes the buck on flow control to the bidding manufacturers for the eight-weeks treatment. Less obvious, however, is the fact that the Curtis team has indirectly repudiated established Air Coordinating Committee policy on flow control. The ACC document "Air Traffic Control and the National Security" (the SWG-5 report of 1950), contains a clearly stated and workable policy on "Flow Regulation" and describes a simple method of implementing this policy.

Representatives of the Air Line

Pilots Assn. asked the Curtis team to reaffirm the SWG-5 method of "Flow Regulation." The pilots were told this would be done. But later, without explanation, the Curtis team chose to scuttle the months-long deliberation of SWG-5 on this tough subject and call for a new rule-making go-round to decide how landing priority will be established and whether the pilot or the control agency will decide when a flight must divert to an alternate airport.

Time of filing vs priority

We should not leave this subject without noting that there is indirect evidence elsewhere in the Curtis report that the time of filing a request is indeed to be the criterion for granting priority in the system. Consider the following passages from pages 12 and 15: "Automatic computing devices should be used to carry out calculations to facilitate scheduling and flow control decisions" and "Before departure . . . the entire flight plan will be confirmed, in principle, to the pilot."

And again (on page 37) we are told that pilots will have "to make, and then faithfully fulfill, a contract as to his ground course, altitude and schedule for many minutes ahead." Nothing is said about what happens when a pilot cannot "faithfully fulfill" his contract. We can guess that the pilot who is unfaithful (because he slowed down for rough air) will have to be diverted to an alternate landing area by the control agency. This so he will not interfere with the "faithful" pilots who are faithfully fulfilling their contracts. If the unfaithful pilot is not forcibly diverted, the team's philosophy will break down completely.

How to control occasional overloading of the traffic system is a jet-age question of paramount importance. No longer can flow control be treated as a problem for solution at some vague time in the future. A clear answer is needed now, but it is not to be found in the Curtis team's report. On this vital issue the "system engineering process" has taken us back 10 years. We have less comprehension on this difficult subject than is found in the SC-31 report of 1948. Quesada should not expect this nasty problem to stay under the rug where the Curtis boys swept it.

Examine next the Systems Engineering Team's recommendations for maintaining safe separation of traffic.

A casual look in the green-bound report is reassuring. On at least 15 pages reference is made to block-to-block separation. A fixed block-control system is specified with blocks large enough to hold in if traffic is interrupted. This is something a pilot can get his teeth into. He won't be cleared into the next chunk of sky until it has been vacated by the flight ahead. This is positive, reassuring when the going gets rough.

A closer look at the team's application of block control, however, is far from reassuring. It is disconcerting.

The report shows clearly that its authors did not understand even the most basic principles of a block-control system. In a block system, a block is reserved ahead for a flight and is not released for use by another until it has actually been vacated. This is what you mean when you specify block separation. Traffic is kept separated on the basis of currently existing conditions—not on the basis of a complex interrelationship of time, speed and weather factors you hope will all fit together at some time in the future.

You can and should organize and arrange traffic so that it will flow smoothly through the block system. But the responsibility for safe separation must be based either on scheduling or on reserving blocks until vacated. In the course of eight weeks the competing manufacturers will learn you can't build a control system until you have a clear decision on whether flights will be separated by prearrangement and time scheduling in advance or by reserving blocks of airspace until vacated.

The team's report has given the manufacturers only confusion on this fundamental issue. For example, consider the ambiguity in the following paragraph from page 41: ". . . aircraft are separated from each other by the use of fixed, reserved airspace 'blocks.' In this method, the airspace is divided into blocks that are fixed and defined with respect to the ground. Each aircraft under management is licensed to occupy a particular block for the length of time the pilot proposes to occupy it. Collisions are avoided by taking care not to license two aircraft to be in the same block at the same time."

Tossing a "hot potato"

The blocks have lost their meaning when pilots are "licensed"—or scheduled—to use a block only for a particular time. Safety must then depend on maintaining the continuing flow of traffic as planned in advance. What will the manufacturers do with this hot potato? But, as every pilot knows, the future flow of traffic cannot be guaranteed.

Even more disconcerting is the team's recommendation to abandon fixed block separation in the terminal area where it is most needed. More than 15 years ago fixed block separation began to be used in air traffic control. First it was simply altitudes reserved at the old-fashioned range. Then came approach control and the area of fixed block control was extended to include altitude laddering at feeding fixes.

Fixed block separation today is applied everywhere that traffic congestion threatens delay. The nature of the problem has forced its application from the terminal area outward. Modern radar control would not be possible without the underlying structure of routes, altitude assignments and the availability (though often not used) of clearance limits for holding interrupted traffic.

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GEORGIA DIVISION, Lockheed Aircraft Corporation, Marietta, Georgia

contradiction of all we have learned on this point to date, the Curtis team recommended abandonment of fixed block separation in the terminal area where it is needed most and applies it only in the en route areas where we have less need for this kind of guaranteed safety.

To make a bad matter worse, the team's application of block control in the en route area is awkward. For example, the team recommends six airways between New York and Washington. Each airway is to have eight altitudes for through traffic and only two blocks between the two cities.

This is bewildering. On one hand, we are asked to throw away the not-yet-installed Vortac system (that we can't afford, and probably don't need) in favor of a new hyperbolic navigation system to get higher navigational accuracy. And in the next breath we are told flights must be separated by an average of more than 100 miles longitudinally along the busiest airway in the United States. Incredible as it may sound, the Curtis team has recommended that we use (in 1975) twice the separation on the New York-Washington route that we use today!

A pilot's jaw will drop as he listens to the team's reasoning: a peak-hour traffic load of 150 aircraft per hour. Easy. We have six airways with eight altitudes on each. Aircraft will follow each other at 20-minute intervals. Six times eight times three per hour equals 144 aircraft per hour capacity. Problem solved.

When he gets around to picking his chin up off his chest the pilot will ask weakly: "Why hasn't someone told those fellows that for a given wind and weather condition most pilots will want to fly at the same altitude? And why, in this age of electronic miracles must I fly 100 miles behind another flight to be safe? And how do I explain the wasted flying time to my boss? Or the rough air to my passengers?"

The reason given for abandoning block separation in the multiple-airport terminal areas is that there is not sufficient airspace to apply this admittedly desirable type of separation. The team then contradicts its own position by specifying a type of operation for terminal areas that requires more airspace per aircraft than we are using in today's operation!

The Curtis team's ramps

Look at the illustration on this page. This is a simplified view of a recommended ramp or "access lane" connecting an airway to a runway. The proposed system works this way:

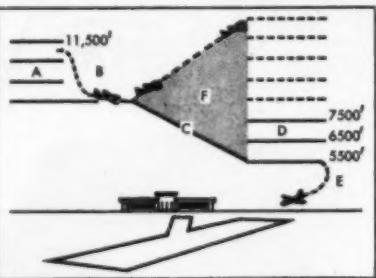
Aircraft capable of "conventional rates of descent" arrive along the airway at (a), are fed through a satellite approach control system at (b) to fly down a precisely defined "access lane" (c), to be held if necessary in "buffer zone" (d) and then fed through final path stretching approach control (e) to the runway.

The access lane is three miles wide and is to be precisely defined by "a

precision slant-beam navigation aid—possibly like a steeply slanting ILS."

This precision-beam-controlled ramp is supposed to save airspace, but on page 45 we read in capital letters: "In all cases, when clearing individual aircraft in a space smaller than that required to hold safely in, there must be a space beyond which is clearly reserved for this aircraft."

Now, to comply with this requirement, simple arithmetic will show that, at minimum, eight aircraft will be on the ramps or passing through the buffer zone at the foot of the ramps feeding one instrument runway. If the runway is blocked unexpectedly, the buffer zone must be eight altitudes high rather than the three altitudes pictured in the team's report.



The entire triangle of airspace (shown as F in the accompanying illustration) must be reserved for flights to leave the ramp to cross and enter the buffer zone at higher altitude. The ramp is actually a wall that must be kept clear of other traffic. The simple fact is: It takes more airspace to reserve a holding block at a remote location and protect the airspace necessary to reach that block than it does to reserve a block of airspace where the aircraft actually is at a given moment.

Of course a picture of a single ramp is gross oversimplification of the problem. There are to be three inbound and (presumably) three outbound ramps in each main direction from each airport. These are to accommodate high-performance, conventional and low-performance aircraft.

Disregarding the ocean side, it will still take 90 ramps for five airports in the New York area by 1975. (This figure is based on statistics in the team's report.) Picture trying to criss-cross 90 ramps (walls of airspace like that shown above) in and out of the New York metropolitan area and you will realize that the team's concept cannot be made to fit the available airspace.

(I can hear a pilot from the back of the room: "Better make that climbing ramp to the west sort of flat, fellows. That coach I fly doesn't climb so good with 85 people and 5,512 gallons of petrol aboard!" But he didn't speak loud enough to be heard in the ivory tower.)

Impossible geometry is not the only thing wrong with ramps. Setting up the final landing sequence more than 30 miles out will frequently trap

the faster airplane behind the slower. In fact the operation will have to be slowed to about the standard 180 mph average speed named in the report. This is artificial delay that is necessary to make the system work. It is delay that will be suffered even when there is no congestion, with ample runway time available.

Perhaps even more costly than this built-in headwind will be the lowered system capacity that will result from locking descent and forward travel into a fixed relationship as is done by the ramp concept. This effectively eliminates the altitude reservoirs that now gives us such high capacity.

The Berlin airlift had no reservoirs, no flexibility and the landing sequence was determined far in advance. These two mistakes cut the capacity of the Berlin airlift to about one-half of what it should have been. We have the proof before us daily. Under far more difficult conditions, and with no better control devices than those available in Berlin, CAA controllers at Washington, Chicago and elsewhere routinely land half again more airplanes in an hour than the best the Berlin airlift ever did.

Those simulation studies

The Curtis team recommended simulation studies to disprove the merits of their proposals. True enough, simulating ATC proposals should separate the wheat from the chaff. But you need to put a little wheat into the threshing machine with the chaff or no wheat comes out.

To throw random ideas blindly into simulation without preliminary analysis is like shooting at a target in the dark and then turning on the light to see whether you hit it or not. To ask for an expensive simulation program to examine the merit of the Curtis team's ramps is about like insisting that an IBM computer add up your grocery bill.

It is not important to convince you that the ramp concept is no good. We could save ourselves the pain. The ramps will fall of their own weight. What is important, however, is the answer to this question: Are the people who are guilty of such shockingly careless mathematical analysis—are these the ones to be entrusted with our multi-million dollar AMB program?

The White House program began and is proceeding on the assumption that the RTCA and ACC committees were incapable and lacked the authority to make decisions. Could it rather be the fact that past development programs of the ANDB paid no attention to the recommendations of the RTCA and ACC? Could it be the White House pinned the tail on the wrong donkey?

Quesada is determined to let a contract by Jan. 1 to get the ball rolling. Let's hope he picks a manufacturer with real honest-to-goodness background in air traffic control. Someone should tell Quesada it is traffic control know-how he needs more than skill with electrons.

Sputniks dull the economy axe

by James J. Haggerty, Jr.

WHILE PROWLING the halls of the Puzzle Palace, which is what we frequenters of it call the Pentagon, I ran into a military type who is connected with the research end of the business.

"How are things in the Tomorrow Division?" I asked.

"Never better," he replied. "Looks like we're going to get some things rolling. And," he added, thoughtfully, "we owe it all to the Sputniks."

He had a point there. While the *Sputnik* made a great deal of political and propagandistic capital for the Soviets, they also made a contribution to American security in awakening the public to the knowledge that our military planners are far from omnipotent and in reversing a dangerous trend in defense programming.

Consider the situation on Oct. 1 in the pre-Sputnik era. The Budget Bureau, with the concurrence of Lovable Ol' Charlie Wilson, last of the calculated riskers, had imposed a spending ceiling for the fiscal year which all but blew our current production programs out of the water. Wilson, armed with a sharp economy axe and a bludgeon to beat down anyone who protested, was fish-eyeing every defense project on the books to see where he could slash another few million. In a decision which should qualify him for the Louis Johnson Memorial Trophy, he ordered an across-the-board whack of 10 per cent in basic research contractual obligations.

Plateaus, peaks and valleys

To quote one Air Force officer who shall be nameless because he likes the stars on his shoulders:

"If Charlie had his way we would have gone back to building B-17s because they're cheaper."

The situation for the current fiscal year, drastic as it was, was only part of the story. With the ever-increasing emphasis on the national economy, the plan called for reduced appropriations in fiscal 1959 and succeeding years. The argument was that we had reached the planned plateau of force-in-being and that less money would be required to sustain it, although in fact we never did reach the plateau.

In short, we were headed for another of those valleys after the peak, like the valley Louis Johnson put us into just before Korea.

On Oct. 4, when Sputnik I hurtled into its orbit, the Pentagon attitude at first was one of complete bewilderment. If they thought of them at all, military men had thought of orbital satellites as interesting, though somewhat wild-eyed, scientific experiments. If anyone outside of the Army ever

recognized their military potential, there was no indication of it. Certainly no one had foreseen the tremendous influence on international diplomacy and worldwide opinion which accrued to the Soviets by being first into space.

As the bewilderment subsided, the military tried the ostrich approach: pretend it isn't here and maybe it will go away. There were statements to the effect that Sputnik was an interesting experiment of dubious military value and that, after all, we still had a good edge in force in being. The latter is probably true, but it overlooks the fact that a stagnant force will soon lose its edge to one whose rate of progress is infinitely greater.

The people made it clear that they were not buying this line. A gale of public opinion swept into the Pentagon and blew a lot of feet off a lot of desks. Then the ball started rolling, slowly, but with a fair rate of acceleration.

Defense Secretary Neil McElroy reinstated the research cut, something he might have done without Sputnik, for he seems to have a more open mind on the subject than his predecessor, who thought research was something you did to automobile grilles. The expenditure limitation was at least partially lifted. Finally, a complete re-evaluation of defense programs, now in process, was undertaken.

As we enter the third month of the Sputnik era, the defense outlook is an optimistic one. There seems to be little chance of increasing the force-in-being, but a strong probability that we will keep what we have. The missile program will be pushed to the hilt. And with the Pentagon's new awareness that science can be helpful, there will be a marked emphasis on advanced research.

But don't get the idea that the Administration has thrown economy out the window. It has not, and rightly so, for the national economy is still in precarious shape. There will be no all-out, don't-worry-about-the-money program. All signs point to a careful compromise.

At least we have stopped the slide into the valley and we will climb part way back up the peak. A suddenly aroused Congress may push us up the rest of the way, if it can resist the urge to make a political football of a critical situation.

In addition to its effect on our budget policies, the *Sputnik* started something else which may not be as pleasant—a new round of interservice arguments which are now seething just below the surface and will erupt any day. The reasons are simple. The

Sputnik successes brought demands for Congressional investigations of our whole missile and science picture which will be in progress from now until the end of the appropriations hearings next summer.

Aside from budget considerations and political name-calling, there are two likely results of such investigations: a reassessment of the roles and missions of the three services with regard to missile operation, and the creation of some sort of scientific command to handle advanced research.

Top management of such a command will probably be civilian, but it seems almost impossible to operate it separately from the Department of Defense, what with the vast investments in talent and facilities the services already have. One service may get operational cognizance of this set-up, and therein lies the battle. Although no one knows what direction Congress and the White House might take, all three services are already organizing their propaganda machines.

Army's position improved

In the matter of roles and missions reassessment, the Army has the most at stake. The Army has never resigned itself to the limitations placed on its guided weaponry. It argues, with a great deal of justification, that setting a range limit for its missiles is as ridiculous as imposing restrictions on the operational radii of ships, subs and airplanes.

Obviously, the time is ripe to bring out these arguments once again before an interested Congress and public and an open-minded Secretary of Defense. The recent successes of the Jupiter missile have strengthened the Army's hand, and if Dr. Wernher von Braun and his Redstone Arsenal group can come up with a workable satellite in a short time despite its belatedly-ordered entry, the Army will have a strong case.

The other argument involves the Air Force and the Navy. In the last go-round, the Air Force won exclusive custody of the big ICBMs, and, flushed with victory, it conceded that the Navy ought to be allowed to develop an intermediate range missile. The missile, the Lockheed Polaris, is now well along in development and has become the Navy's pride and joy.

But here's the rub. The Navy is not calling it an IRBM, but has come up with a new designation—FBM, for Fleet Ballistic Missile. The Navy's point is that it is not an IRBM at all, but actually has intercontinental capability because it can be launched from a submarine in close to Soviet territory. It has obvious advantages over the ICBMs, the Navy adds—chiefly, target accuracy because of the shorter range it must travel and mobility of the launching platform. The Air Force has only recently become aware of this new threat and is now busily organizing the rebuttal.

'Big Four' of Texas aviation industry in good shape

by Lois C. Philmus

THE ECONOMY TORNADO that roared through the aircraft industry in the last couple of months shows definite signs of waning. Damage left in the wake of the big wind indicates some temporarily depressed areas, particularly in the No. 1 defense production center, Southern California.

The storm, however, apparently left its most negligible effect in the tornado-susceptible Dallas-Fort Worth area. Some trimmings were knocked off, but the basic structures of the four big manufacturers in the country's third largest aviation area appear relatively unscathed.

Although the Defense spending programs are anything but settled and firmed up, the Texas area has a unique foundation. Three of the four companies hold contracts for four of the military's top priority programs: USAF B-58; Navy F8U-1 and Regulus II; and the Army H-40 turbine-powered helicopter. The fourth company, one of the largest subcontractors in the nation, early diversified into airframe, engine and missile work while building up a ratio of important original products.

The four companies—Convair's Ft. Worth Division, Chance Vought, Bell Helicopter Corp. and Temco Aircraft Co. in the Dallas vicinity—account for \$650 million in annual military sales, have a combined backlog roughly estimated at more than \$700 million and—even after laying off about 10,000 employees—still provide employment for more than 60,000 in the area.

Future seems bright

Combining realism with optimism, the four companies are energetically cutting costs for maximum efficiency, but with a certainty for the next few years that contracts will be coming through. Company by company, here's what has been happening:

Convair-Ft. Worth received the first fiscal 1958 contract awarded by the Air Force, to the tune of \$12.5 million, for some long lead-time items for the first inventory quantity of B-58 supersonic bombers. First big "buy" will be made in fiscal 1959 for a reported quantity of 95. Yet to be announced is the firm contract for 17 more evaluation units that will bring the total to 30.

The B-58's future seemed more secure when President Eisenhower called it the B-52 "replacement" in the first address of his "reassurance" series. Officially it was billed as the B-47 successor. However, as AMERICAN AVIATION reported earlier this year, USAF planners concede that the B-58 may conceivably take over some intermediate B-52 missions. Thus, the B-52 would become a more highly specialized long-range strategic aircraft.

USAF originally had been reticent about Convair's claims for the new aircraft, but now officials are echoing the company's enthusiasm. One inference that can be drawn is that flight tests, exceeding expectations, have proved that the B-58's range is significantly greater than originally anticipated. If true, Convair can count on producing not only B-47 replacements, but possibly an additional quantity to accomplish longer-range missions.

Chance Vought has had its share of cutbacks and stretchouts, but they have been relatively light. The company finds itself in an enviable position as a major Navy contractor. It produces the F8U-1 and the Regulus I and II. Currently Chance Vought is developing the successor to the Crusader, the F8U-3, in competition with the McDonnell F4H. Winner probably will be selected late in 1958.

The company was notified last month of a mild stretchout for the Crusader, but further cuts beyond the number lopped off last summer are ruled

out. Company officials have declared that 1957 sales will be unaffected, and that 1958 sales will be increased. Regulus I phases out in a year, but Regulus II will be in full production at that time.

Studying civil market

Chance Vought has a virtual guarantee of continuous production lines for a minimum of four years. During this period, advanced developments will receive serious attention, with an eye to the future. A new advanced weapons division—with status equal to the aircraft and missiles divisions—has been organized with that purpose in mind.

Despite C-V's relatively "fat" condition, its executives are acutely conscious of the company's complete dependence on military funds. Thus C-V is quietly studying ways to enter the civil market. No plans are firmed up, but every possibility for commercial production is looked into. Possibilities

Aircraft industry and military 'playing game' in contract negotiations, says Esenwein

USAF and the aircraft industry today are paying the penalty for "playing a game called come stick your head in a sandbank with me," according to a leading industry figure.

A. C. (Gus) Esenwein, vice president and general manager of Convair-Ft. Worth, noted that the "game" is played by both industry and the military. First, contractors tend to minimize cost estimates of programs while in competition. Then, during contract negotiations, the military tries to get the lowest cost possible *below* the estimate.

Negotiations, particularly under cost plus fixed-fee contracts, take no heed of future cost contingencies for increased labor, materiel and other costs. But, the contracts are signed, Esenwein said, with "everyone recognizing the foolishness of figures which they show to each other." Then, the facts of life begin to assert themselves.

Pentagon funds are requested and allocated on the negotiated figures rather than realistic estimates. Natural outcome is what has caused today's spending dilemma—large overruns because of poor estimating and woeful underestimates of cost requirements. Spending rates become even more rapid as lead-times are shortened and estimated schedules met.

Esenwein noted wryly that a top Air Force official recently told industry: "You guys are spending too fast. You took us seriously about compres-

sing lead-times." More seriously, he pointed out that more and more companies are meeting predicted schedules and the military—taken by apparent surprise—has not programmed funds for such a contingency.

Spotting the cause, Esenwein found that, ideally, spending could be checked in the future by clearer definition of the services' roles and missions. Such clearcut definition would enable both industry and the military to exercise better judgment at the inception of development programs.

To meet the immediate emergency, the contractor has had to make three moves: (1) look at the job; (2) look at the Air Force assigned quota; (3) determine minimum materiel needs and costs.

From these factors, he then must know how much has to be borrowed. If the gap between spending and availability of funds still exists, production slippages must follow.

Big quandary comes in obtaining any savings from stretchouts. If a high rate production program is stretched, it is difficult to save on materiel. More layoffs means getting caught up in the fixed portion of overhead.

Esenwein concluded that it is very difficult to achieve immediate expense reductions in this area without outright cancellation of a program. "You cannot automatically stop momentum generated by industry in its buildup to a production rate," he observed.

considered thus far include merger with a helicopter company.

But the immediate future calls for getting the Crusader's successor into the air by mid-1958. Navy is trying to evaluate between one-man and two-man fighters as manned aircraft climb in Mach numbers, altitude and complexity. Flight tests will tell the tale.

Bell Helicopter Corp. is shooting for a 50-50 break between military and civilian sales. Commercial sales have been the best in years. The turbine-shaft powered H-40 for the Army will be the No. 1 dollar-maker for military sales next year.

Army has invested \$20 million in its top priority YH-40 program to date and the first inventory procurement is expected to be in the \$50-million range. Planned production schedule calls for a minimum of 10 helicopters per month. Evaluation deliveries will begin early next year and extend into early 1959, with production models being delivered in substantial quantities early in 1959.

Building up inventory

Bell's "bread-and-butter" H-13 contract with the Army for fiscal 1958 was placed in some jeopardy recently. Army ordered its technical agencies to undertake an accelerated comparative evaluation between the H-13H and the Hiller H-23D. Decision on which to procure should be made by the end of this month.

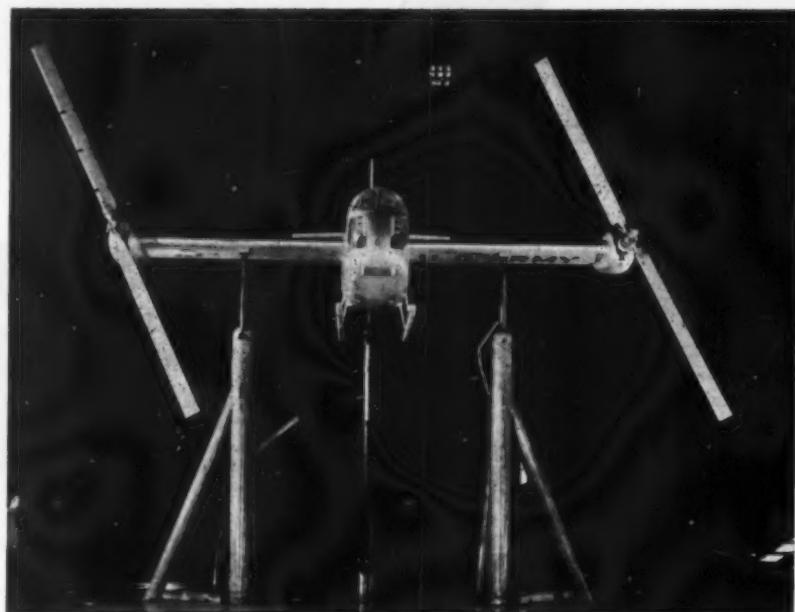
But Bell is not just sitting by. As the H-13 military line is drying up, pending decision on a new contract, the company is putting through a batch of Model 47s. The system has been in operation for a year. When a military line slows down, Bell produces a quantity of commercial models for inventory much in the same way as automobile manufacturers. In this way, when a commercial order is placed the customer can expect immediate delivery—rather than having to wait six months to a year.

Under this system, Bell expects to have produced 150 Model 47s by the end of the year. About 120 will be sold. Thus Bell will have a small inventory of 30 to begin the new sales year in 1958. In this way, Bell's production line is kept moving, commercial customers get automobile-like service on deliveries, and the company acquires a built-in stability.

Temco—in the gloom-and-doom atmosphere shrouding subcontractors—stands strong and fearless. A top official declared that as long as large subcontractors can provide service and products cheaper than the prime contractor, they will be in business. However, the marginal subcontractors—utilized mainly to solve space problems—will slowly fade out of the picture, he added.

Operating under this policy, Temco early took the initiative to strengthen both its position and its ability to keep costs down. Biggest decision was to abandon a plan formulated about a year ago, which called for the

Convertiplane completes windtunnel tests



TILTING-ROTOR Bell XV-3 has completed windtunnel tests at the National Advisory Committee for Aeronautics' Ames Aeronautical Laboratory. During tests rotors went through full range of conversion from vertical flight to full forward. Craft is powered by single Wasp Junior R985 engine mounted in fuselage. Power is transmitted to wingtip rotors by shafts.

establishment of separate operating divisions for missiles, aircraft, and modification/overhaul.

Now the company is moving in the opposite direction—toward greater integration—with vast savings in overhead anticipated. In essence, it is going from a divisional to a functional concept.

Temco is also planning diversification. Originally, a specialist in airframe subcontracting—Temco has entered the engine field with a major component subcontract for the Ford-produced J57. Negotiations for building missile components are actively under way and company officials are predicting higher sales in 1958.

Temco is deep in prime contract work also and wants more. It is weapon-system manager for the Navy's Corvus missile and another missile development is rumored under way. The company also expects a new \$6-million contract for its TT-1 Pinto primary jet trainer.

In another aggressive move, Temco plans to establish a basic research group. Scientists will be asked to help work on known military development problems but they will also be given an opportunity to pursue their own projects. Thus the company will be able to offer the government the best results of its own scientific thinking.

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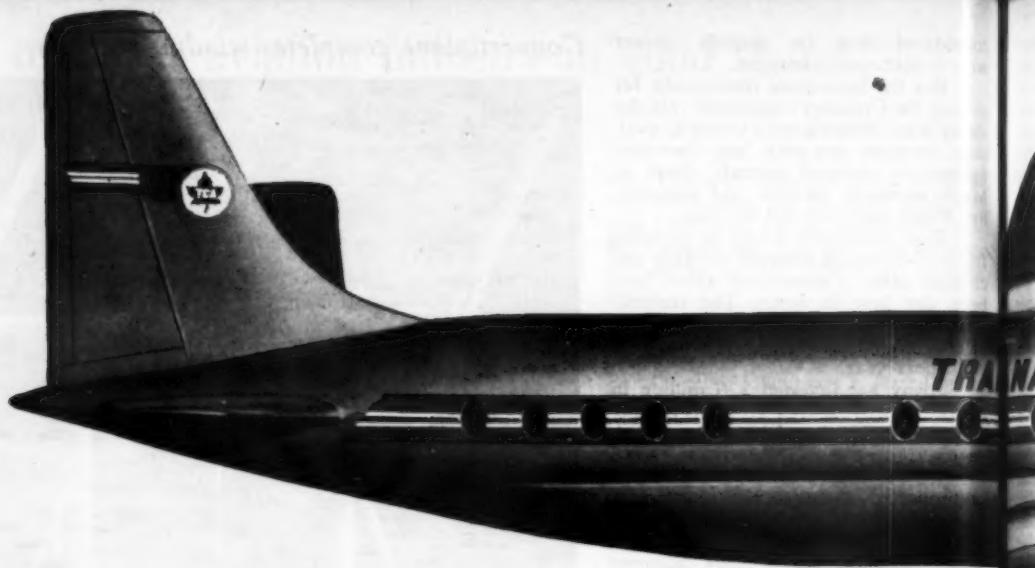
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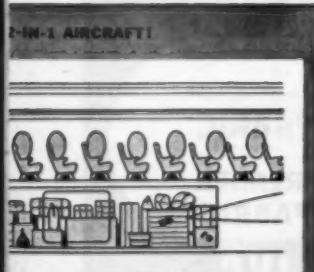
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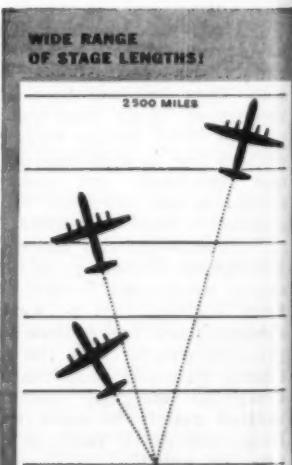
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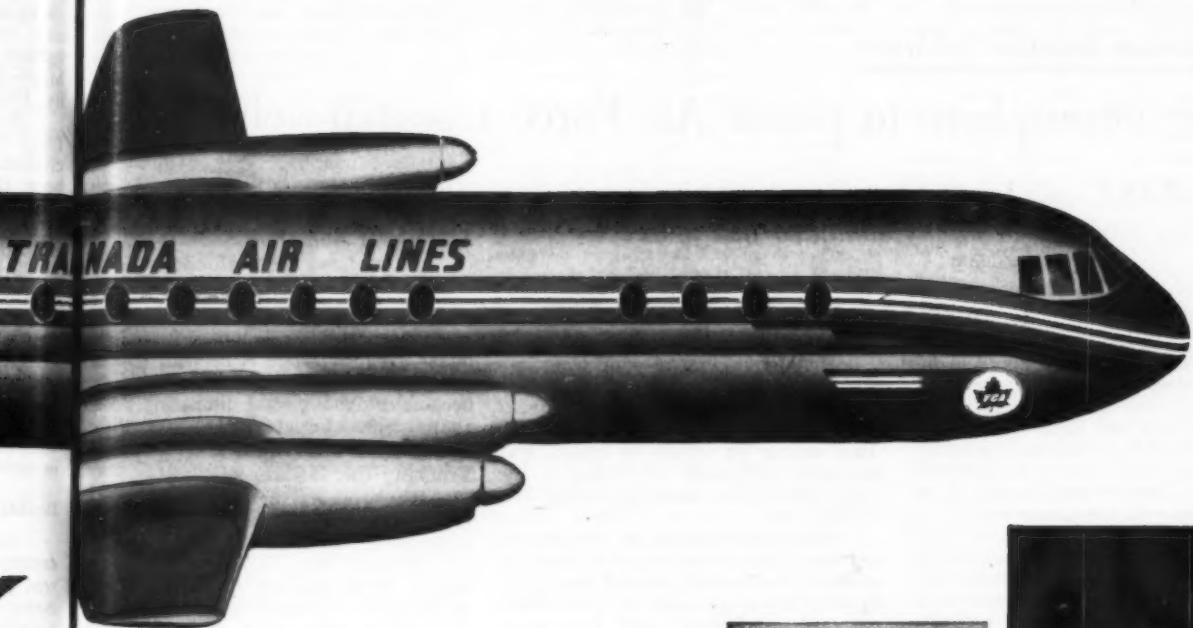
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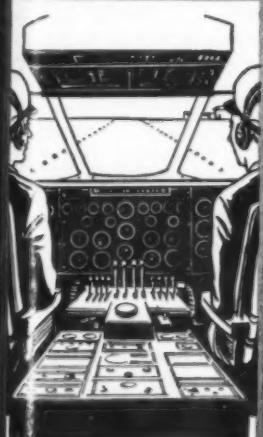


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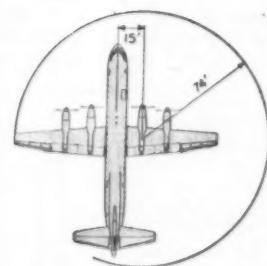
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An American Aviation Exclusive

Upper atmosphere to power Air Force research vehicle

Project HARE calls for flight at 60 miles' altitude, where free oxygen will supply unlimited fuel source

by William Beller

HIGH-ALTITUDE, research-type vehicles powered by energy stored in the upper atmosphere have passed the theory stage and may soon crystallize into prototypes and flight tests.

Prospects have dimmed, however, for applying such energy to satelloid-type craft—manned vehicles able to fly in the fringes of the atmosphere.

A recently completed study made by Rensselaer Polytechnic Institute for the Air Force Office of Scientific Research (Air Research & Development Command), discloses that a high-altitude lightweight craft able to fly at about 60 miles' altitude is now being planned. Traveling below Mach 2, it would scoop in an atmosphere heavily studded with uncombined oxygen atoms, recombine them on a catalytic plate to extract heat energy, and push the products out the tail, thereby getting forward thrust.

Oxygen molecules dissociated

Project name is HARE, standing for High-Altitude Recombination Energy. Basis of the idea is this: radiant energy normally received on the earth's surface is heat energy. In the upper atmosphere, though, part of the solar energy is stored by means of a photochemical reaction that dissociates oxygen molecules into free atoms.

Because of the high energy needed, only a small part of the sun's energy spectrum—radiations in the far ultraviolet region—causes this reaction. When the atoms are recombined, the stored energy is released. Oxygen atoms formed at the lower altitudes react with molecular oxygen to form ozone.

The rate of recombination of the oxygen atoms is important. If they recombine immediately after dissociation, there is only small solar energy storage. But if no recombination occurs, energy is absorbed until only free atoms exist.

At low pressures, which are characteristic of the upper atmosphere, recombination is slow. At 60 miles' altitude, for example, a free-oxygen atom could exist for several days before recombining. But at the lower altitudes and correspondingly higher pressures, an oxygen atom's life is measured in small fractions of a millisecond. Therefore, only at the higher altitudes can

useful work be extracted.

If a suitable metal plate were immersed in this atmosphere, oxygen atoms would recombine on its surface, thereby releasing energy of dissociation. Thus an air jet would be heated and expanded sufficiently to propel a vehicle. This is the reasoning behind the HARE.

Chief investigators on the project say that HAREs are to serve only as scientific instruments, whose mission is to learn the upper atmosphere's chemical makeup. Should there be a high oxygen-atom population, much higher than theory presently indicates, then manned craft able to take fuel continuously from the atmosphere are a possibility. If current theory is right, though, some prospective satelloid travelers will have to discard one of their most comforting ideas.

Preliminary design calculations point to a 150-gram craft which would probably be shaped as a coleoptile. A 40-gram thrust is expected together with a 200-gram lift. Some experts say that this lift figure is a highly opti-

mistic one. Unhappily too, a 2-square-meter exhaust nozzle is needed, which could cause severe structural problems because of the weight limitation. An alternate model might be equipped with wings.

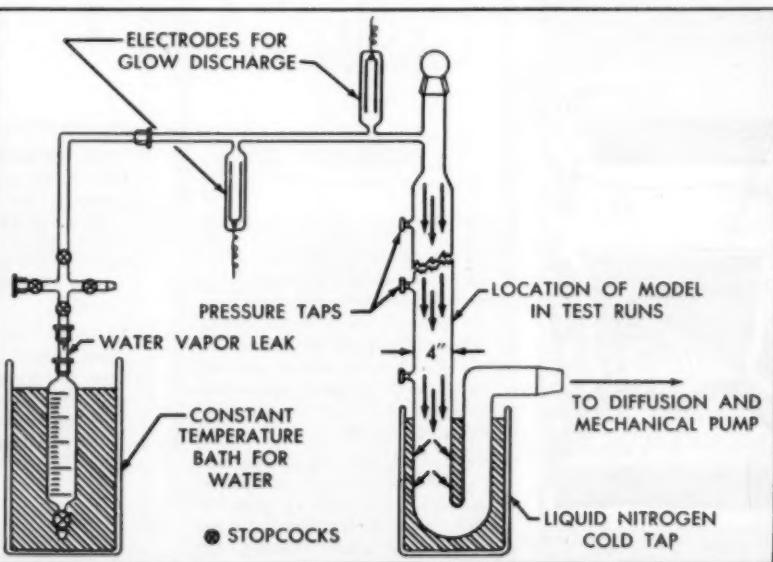
Tracking the HARE

It is proposed to rocket-launch the HARE at altitude and track it by infrared or radar beams.

Because the HARE constitutes only a small payload, there would be no problem in launching it. However, the vehicle's size might cause a packaging difficulty.

Background for the work was contributed by selected AFOSR contractors, who for the past several years have been seeking ways to use the energy stored in the upper atmosphere to propel aircraft and missiles. First practical demonstration of the principle of recombining oxygen atoms was given by Rensselaer scientist Dr. Paul Hartack.

Almost a year and a half ago he persuaded the AF Cambridge Research Center to test-fire a rocket which would



FAST PUMPING SYSTEM is needed to windtunnel-test models of the HARE. To do this at reasonable cost, a unique system is being developed. It will use water vapor as the gas and pump it by condensing the vapor into a large liquid nitrogen trap. With this technique, vapor velocities approaching Mach 1 are expected.

release nitric oxide (NO) into the upper atmosphere. The chemical combined with free oxygen to form nitrogen dioxide (NO₂). A brilliant reddish-yellow cloud was generated, whose luminosity corresponded almost exactly with Harteck's earlier predictions.

Subsequent work by Harteck and others was aimed at (1) finding a suitable catalytic material that could quickly combine the oxygen atoms, (2) determining a suitable design configuration for the vehicle, and (3) learning the free-oxygen concentration at the higher altitudes.

Gold probably best catalyst

Experimental results indicated that gold is an excellent catalyst for oxygen recombination, is probably the best that can be found. Harteck and his associate, Robert R. Reeves, Jr., found that recombination of oxygen atoms on a gold surface raises the temperature higher than that of any other catalyst used at the same pressure. Two reasons are given for this action:

(1) Gold forms a weak oxide which acts as an intermediate catalyst. Therefore, the gold surface acts on almost all oxygen atoms that hit it and, with high efficiency, turns them into molecules.

(2) Greatest heat loss at higher temperatures is through radiation. Gold has one of the lower radiation emissivities and therefore keeps radiation losses small.

Temperature within the vehicle will be nearly constant, and should range between 500°C and 600°C. The system should certainly reach the lower temperature because here the radiation losses are quite small. But based on the "fourth power" radiation law, above 600°C the losses are more than 50% greater than at 500°C. Unless these losses can be radically cut, higher temperatures are not practicable.

Harteck points out that even if radiation shielding is used, the ports of the HARE are still open and direct radiation out of these ports difficult to prevent.

Based on an internal temperature of about 550°C and an ambient temperature of -70°C, Harteck concludes that the maximum velocity of the HARE is Mach 2.

Considering aluminum, mica

Two alternate materials are being considered for the HARE's construction—aluminum and mica. A HARE made of aluminum would be more flexible than one of mica because of the metal's elasticity. For temperature resistance, though, mica is the better material. Water glass would be used to cement the mica structure. No cement has yet been chosen for the aluminum.

In each of these constructions, it is necessary to gold-plate the combustor section.

In an example worked out by the investigators, they consider a

A report on testing techniques and design calculations for the HARE is available. Write to Director of Aeronautical Sciences, Air Force Office of Scientific Research, 14th and Constitution Aves., Washington 25, D. C.

HARE flying at 95 kilometers' altitude, where the ambient pressure is about 2.6 milligrams per square centimeter. Weight of one cubic meter of this air would be about 3.6 milligrams.

If half of the oxygen present is dissociated, of the original 20% oxygen present, then 10% of the air is dissociated oxygen or 0.36 milligrams. This is equivalent to 1.3 calories heat of dissociation for each original cubic meter of air. Of this quantity, possibly only one calorie would be recovered by an efficient catalyst because all molecules would not reach the catalyst.

Conversion to thrust

The investigators assume that the missile would fly at about 400 meters per second. This means that with a one square-meter intake cross-section, the craft would process 400 cubic meters of air per second. This is equivalent to 0.4 kilocalories of

energy released.

A reasonably efficient engine, say the investigators, should convert 25% of this energy to thrust. At a velocity of 400 meters per second, this would mean a push of about 100 grams.

The investigators say that normally a thrust can generate a lift force five times as great, in this case, about 500 grams. Hence, if a comparatively inefficient engine and radiation losses with 10% conversion are assumed, the thrust should be 40 grams, the lift, 200 grams. With materials readily available, it appears possible to build a vehicle weighing 150 grams or less.

Based on these calculations, there does not appear to be hope for making a manned vehicle that could sustain itself on free atmospheric oxygen atoms alone. The field is wide open, though, for using such a propulsion system in a mixed powerplant set-up. However, it is not known in unclassified circles whether this concept is being pursued.

Because this work on the HARE has led to applications of interest to the Air Force, Harteck's contract was recently picked up by Cambridge Research Center in order to carry on development of his ideas and techniques.

Exclusive

Douglas uses novel test-strip method on DC-6, DC-7 structural components in fatigue research

An ingenious method of evaluating the load-cycle history of DC-6 and DC-7 transports is being field-tested by Douglas Aircraft Co. as part of a broad program of research on service life of airplanes.

If operating experience verifies results of laboratory tests, Douglas indicated, the method will lead to a means of establishing a basis for detail structural inspections more accurate than flight-hour criteria currently used.

The simple testing device is a strip of .032-gauge aluminum, three-quarters of an inch wide, machined down at intervals to form a series of laboratory test coupons of graduated size. The strip is attached to various

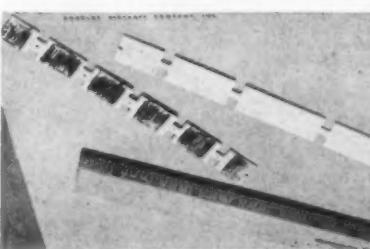
structural components with the test portions left free.

As a result of this arrangement, the test coupons experience the same fatigue environment as the structural parts to which they are attached. Test-strip design causes the stress in each section to be magnified over the stress of the structure.

Under repeated load-cycling, the coupon sections begin to show signs of fatigue loading progressively, beginning with the coupon having the greater magnification. A correlation between the statistics of test-strip indications and aircraft operating times will provide a load-cycle history for each airplane.

Douglas is asking operators who participate in the test program to inspect the test strips and report results at 300-hour intervals on easily accessible installations and at 2,000 hours at other locations. Currently, Douglas is attaching 10 strips on DC-7Cs in the program, four on the front spar of each wing, one in the hydraulic compartment and one on one rear spar root.

Douglas engineers hope the fatigue investigation program will make possible some detail inspections on the basis of test-strip conditions rather than airplane hours, which would result in improved reliability at lower cost.



FATIGUE test strips are bonded to critical wingspar locations of DC-6s and DC-7s in Douglas research to compare loading cycles under varying conditions.

Missiles thrust dual role on accessory engineering

Differences in development cycles require different approaches for manned and unmanned aircraft, Bendix finds

by Henry P. Steier

SUPPLIERS OF ACCESSORIES for manned aircraft have been convinced their advanced engineering planning must play a dual role.

That role will be to plan with one foot in the manned aircraft field and the other in the more rapidly changing missile field.

Although the technologies of the two fields are not necessarily different, the advance engineering planning needed can sometimes be very different. Companies with wide experience that understand this new duality stand a good chance of holding their own against competition from firms appearing on the scene purely as missile accessory producers.

One of the firms which has recognized this problem and is doing something about it is Bendix Aviation Corp.'s Red Bank division.

A typical problem area is electrical power. Building efficient sources to supply mounting power-consumption needs in aircraft has been a major part of the Red Bank division's effort.

Power is also a big problem area

in the missile industry, where it is needed for guidance, tracking, telemetry and control.

Explaining the changing picture in this field, Red Bank's director of sales and service, N. P. Barny said, "In aircraft, we knew from the beginning what power was needed. In missiles, the need changes rapidly.

For example, there might be eight phases in a given missile development. These might call first for certain tests on devices at low altitude. Then these are eliminated and the next phase could call for higher altitude flights, where different tests are carried out, and so on."

These various phases might each call for different amounts of power, frequency accuracy, etc., and thus different generating equipment.

Learned to anticipate needs

"We got wise," Barny said, "to the vast amount of engineering going into each new need. So instead of designing for each application we went

ahead and designed accessories to meet expected orders of progression for increasing accuracy of voltage and frequency control, and efficiency that will be needed during evolutionary phases of missile development."

An example of the need for progressive refinement might be in guidance systems where gyros are used. Fluctuations in the voltage and frequency supplied to guidance gyros cause errors.

Each little error that might add up to 1 degree in guidance direction could cause a 100-mile miss from the target. Thus, the requirement for increasing accuracy of power-generating standards is a known "must" for future missiles.

The division has a long history of successful business as a supplier of power-generating devices for the aviation industry. It has been a big producer of ac and dc generators for the Century series of fighter aircraft, as well as a full line of dc to ac inverters ranging from 6 volt-amperes to 7 kva for aircraft and missiles.

Big competitors in the generator field have been General Electric Co., Jack and Heintz, Inc. and Westinghouse Electric Co. But even with this strong competition the division has an outstanding record among Bendix Aviation Corp.'s many divisions.

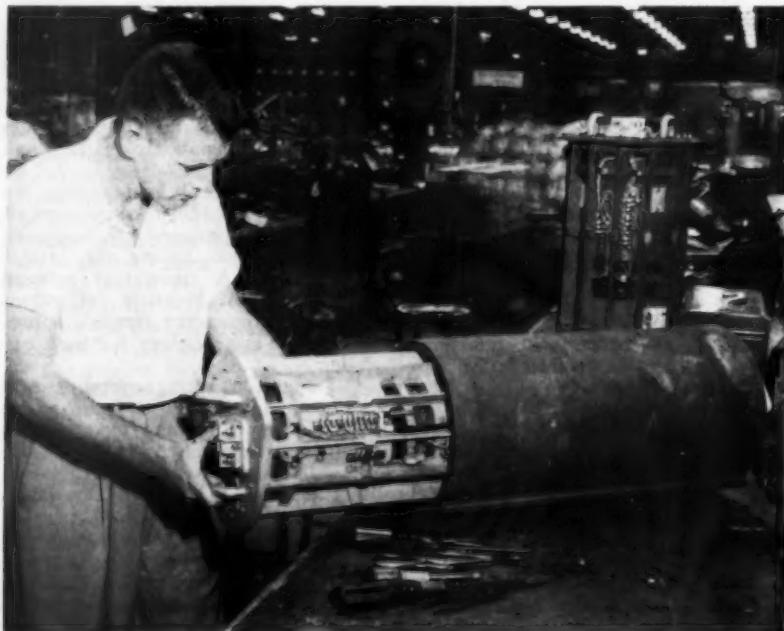
The inverters supplied by Bendix to the missile industry are rotating devices. Battery-powered, they generate ac for powering instrumentation, guidance, telemetry, etc.

New technological race

Bendix Red Bank inverters are being used in most missiles now operational and under development. Big missiles such as an IRBM or ICBM might carry two inverters used either as primary and standby sources, or for different purposes in the main vehicle body and in a nose cone for operating nuclear devices.

In the missile inverter field, the company now faces a new kind of technological race which has spurred the design progression policy explained by Barny.

The race is to prove whether improved weight-power efficiency as well as performance of short-duration flight inverters can best be obtained by using traditional battery power or by going over to turbo-driven alternators.



FIRST PICTURE of short-duration-flight high-powered inverter designed by Bendix Red Bank division to supply ac power in ICBMs. Richard Mulligan is shown sliding inverter into magnesium canister where it operates in sealed condition at sea level to 100-mile-altitude conditions. No external cooling is needed.

The turbo-alternators would be driven by fuel-oxydizer combustion using whichever of these propellants was already available in the vehicle.

Recently, in considering the needs of ICBM vehicles, the weapon-system planners have thrown out the challenge to battery-inverter and turbo-driven alternator producers to show which system can reduce weight to a minimum.

Among the competitors in the turbo area are the relative newcomers, Leland Electric Co. and Aerojet General.

Although the turbo devices are admittedly much better from a weight standpoint, their designers are handicapped by poor controllability of propellant combustion. This means that speed variations in the generators are apt to be very wide.

These variations cause wide fluctuation in the voltage and frequency output characteristics, which is just where requirements are becoming more stringent in missile work.

Unique inverter being produced

At this time Bendix has a unique short-duration-flight canister inverter ready for use in ICBMs. Three models of the new inverter are being produced. Called "environment-free" by the company, they are completely sealed against the effects of altitude and can withstand conditions from sea level to 100 miles altitude.

The new inverters are cylindrical and shaped to slide into a pressurized magnesium can, where they operate in an air atmosphere. Construction is unusually rugged for use against vibration and shock environments expected in ICBMs.

Very important feature of the new inverters is the method of regulating frequency and voltage. This is done without moving parts by a potted magnetic amplifier regulator.

Operating from a battery input of 26 to 29 volts, the three new ICBM inverters produce outputs of 1.5, 3.0 and 7.0 kva at 115/200 volts, three-phase. Weights are 65, 75 and 115 lbs. The units will operate over a temperature range of -35°C to $+200^{\circ}\text{C}$.

Although the new inverters are known as short-duration flight equipment, which in ICBM work means a few minutes, they will operate to 150 hours outside of the canister.

Use of a static-type regulator marks the first step toward ultimate elimination of all rotating elements in inverters, according to Barny.

He feels that by the time others come up with turbo-driven auxiliary power units that will satisfy missile weight and regulation needs, Bendix will have a fully static type to propose.

The company will not divulge how this will be done, but estimates that an inverter now weighing 65 lbs. would be cut to 20 lbs. by using static-type dc to ac conversion.

Clue to the way Bendix would do this might lie in use of semi-conduc-



TO BE ANNOUNCED soon, this metal-ceramic receiving tube is one of a new line being developed for the Air Force by Bendix. Tube is $2\frac{1}{4}$ inches long.

tor devices. Current-switching capability of transistors is mounting and tens of amperes can be handled.

Use of transistors to generate square waves which would be changed to sine wave forms is conceivable. Theoretical studies show that efficiency of inverters might go from the approximately 50-55% efficiency now achieved to 90% with static devices. Bendix is working along these lines in its advanced planning.

One of the big problems with such methods of inversion is the high distortion factor encountered in the sine wave output. Permissible distortion today is less than 1%. Static inverters thus far built have around 5% distortion.

Batteries may replace inverters

The division believes the day will come when inverters will disappear and power will be generated either chemically, by thermal batteries using dissimilar metals, or nuclear batteries.

Work is already under way on chemical generators which develop phenomenal amounts of power from chemicals weighing a few grams.

At the same time it views the future of missile needs, Bendix has a full-powered program covering all avenues of rotating power unit development. By the time chemically-powered and nuclear-powered aircraft appear, it expects to be in position to fill their needs.

While companies such as Westinghouse are said to be concentrating on brushless generators, Jack and Heintz on oil-cooled generators, and General Electric on statically-excited

generators, Bendix has developed models of each type. They are in a position to go ahead on any one if the need arises.

In line with the outlook for semiconductor devices in power generators, the Red Bank division produces large quantities of the devices.

This activity was started in 1956. In the first month's operation of the transistor facility at Long Branch, N.J., 1,500 transistors were made. Production is about 125,000 a month now.

The transistor department expects to be in production soon on military-type silicon power rectifiers which will handle 10-20 amperes at 125°C . The company produces a broad line of power transistor types, and expansion of the line to high-frequency germanium and silicon types is expected in a few years.

Big business in tubes

A big business with Red Bank division is manufacture of ultrahigh quality receiving, power and microwave tubes. The special quality tubes built by Bendix fill needs that cannot be met by ordinary commercial tube types.

In cases where equipment manufacturers have a problem caused by overdesigned circuits, they call on Bendix to produce tubes that give 20-30% more output than average types.

Materials used by Bendix in these tubes include such expensive materials as nonex glass, ceramic spacers, mica-lex bases, aluminum oxide sleeves around helical filaments, etc.

Special tubes that might cost \$50 each, as compared to ordinary commercial types that cost a few dollars each, find their way into autopilots, radar, air defense computers, missile guidance, etc. Biggest customers are Western Electric Co., Westinghouse Electric Co., Sperry Gyroscope Co., AC Spark Plug and IBM.

The tube business represents about 20% of Red Bank's activity. Tubes are made in lots of 50 to 1,000. Over 300 types are produced.

A complete line known as HY-G-300 is made for survival under high acceleration, shock and vibration, and is capable of operation at 300°C bulb temperature. In addition to this line, spark-gap tubes, klystrons, traveling-wave tubes and a new backward-wave oscillator are produced.

The backward-wave oscillator, to be announced soon, will be used in a new aviation application and is designed for high-temperature operation. Frequency range is 49 to 59 kilomegacycles, with a peak output of 10 milliwatts.

In line with its policy of keeping abreast of new aircraft and missile needs, Bendix has developed a new ceramic metal tube line for the Air Force. Tube cost is now \$100 each. Ultimately it will be about \$25. Unannounced to date, the initial line includes the TE-31 and TE-34 beam power amplifiers, TE-32 low-mu triode and TE-33 half-wave rectifier.

Hydraulics ready to meet demands of supersonic age

by William O'Donnell

THE OUTLOOK for hydraulics is high—in temperature, speeds and pressures. But just what steps must be taken to meet the requirements of supersonic flight will be determined by the military and aircraft builders—and manufacturers of hydraulic components are capable, ready and willing to meet any realistic requirements.

This was the consensus of the 7th annual aircraft hydraulics conference sponsored by the Aero Hydraulics Division of Vickers, Inc., at Detroit last month. Attending were some 100 representatives of airlines, airframe manufacturers and government agencies.

Conference papers this year highlighted such topics as the optimization of hydraulics, new components, practical experience with the latest hydraulic equipment and how to keep hydraulic systems going.

New 4,000-psi system

Practical experience with a 4,000-psi, 275° system was described by B. S. Wood, staff engineer, mechanical equipment, Avro Aircraft Ltd. He told of his company's installation of the high-pressure system in its latest fighter craft, presumably the CF-105, to meet high horsepower demands of surface controls, heavier landing gear and other basic needs of the new supersonic, large fighter.

The system in the CF-105 is being tested functionally on the ground and has not yet been tested in the air.

Wood said that initial project work on the aircraft was carried out on the assumption that a 3,000-psi hydraulic system would be used but that installation of the two elevator actuators became a major problem. It became apparent that a higher operating pressure was the only solution.

"Coupled with a correspondingly reduced flow," he said, "this would allow a high response to be maintained with reduced actuator and valve size . . . Although 5,000 psi would give a more comfortable space margin, considering the potential difficulties with equipment procurement—particularly pumps, ground equipment, seals, fittings and flexible connections—it was considered this pressure was out of reach."

Wood added that besides the elevator actuators, space problems also showed up in other components and areas. Thus the decision was made to operate the utility system at a nominal 4,000 psi.

"Because the aerodynamic, engine and hydraulic power sources of heat extended oil temperature to the limit of 275°F, the temperature level is maintained by a heat-exchanger system and an airless-type reservoir is used," Wood said.

Three independent systems are used—two for flying control and one for utility circuits. Six 10-gpm pumps at 4,000 psi create a total hydraulic hp of 300. The pumps are Vickers Model PV-4915.

During a tour of the Vickers Administrative and Engineering Center following the conference, a display and demonstration of qualification performance tests being conducted on a model of the variable-delivery, pressure-compensated 4,000-psi pump was presented.

The unit has a ductile iron cylinder block with a microplated valving surface. For protection, the pump case has an integral relief valve set to crack at 250 to 300 psi. Pump is said to be capable of continuous operation throughout a speed range of 750 to 3,250 rpm and intermittent operation at speeds above 4,000 rpm. It is rated for temperatures from -65° to 225°F.

In the high-speed department, R. D. Montgomery, group supervisor, advance design group at Vickers, revealed that the company has designed a 911 size pump capable of 6,000 rpm. The unit has a rotating group using 11 cylinders instead of the nine cylinders used in the company's standard aircraft piston pumps.

Accumulating experience

During the past year Vickers has accumulated a total of some 3,500 hours at speeds of 6,250 to 7,800 rpm and pressures from 3,000 to 5,000 psi with fixed-displacement units. Now under test is a variable-displacement pump which, according to Montgomery, shows every indication of equaling the performance of the fixed-displacement units.

In addition to work on the 11-cylinder pumps, Vickers has run complete performance curves on the 906 size pumps at speeds to 20,000 rpm and the company's Research and Development Department has used a modified PF-3906 pump to reach 30,000 rpm for short periods.

For high-temperature work, Vickers is constructing a testing facility which should be ready for occupancy in a few weeks. The company will con-

duct tests at 700°F as soon as it moves in and plans to conduct 1,000°F tests sometime next year.

Other developments revealed at the conference included:

Lockheed Aircraft Corp. is "manifolding" some of its hydraulic systems to save space, weight and number of parts. Other advantages include less leakage, less maintenance, easier installation, reduction in spare parts. The manifold can be designed for best system operation.

Among the disadvantages of the manifold system, said C. H. Cannon of Lockheed's mechanical systems engineering unit at Marietta, are its defiance of standardization, requirement for new design, longer lead-time, inflexible design. It is expensive to fabricate in small quantities; offers little choice in location, greater risk of troubles and a logistics problem created by use of nonstandard parts, he added.

Cannon used a C-130 rudder boost assembly as an example of a manifold designed to fight the problem of getting fluid into a hydraulic cylinder that has motion, without flexible hoses. As a result "the final design is clean and simple with elimination of many fittings and lines and minimized leaks."

Organic materials critical

North American Aviation's George R. Keller discussed the optimized hydraulic system through high-temperature compatibility. He pointed out that the upper operating temperature of hydraulic systems is determined by the organic materials in the system—fluids, elastomeric seals, anti-extrusion rings, electrical insulation. He said that "at the risk of some argument, at temperatures above 600°F the organic materials have no significant operating life."

Citing advantages and disadvantages of various hydraulic systems in coping with the temperature problem, Keller concluded that "in a 550°F environment any advantage an uncooled system might have enjoyed over a cooled system will have disappeared."

"When the compartment temperatures exceed 600°F, the employment of artificial thermal environments may be the only way in which a system, using present-day materials, may be made to perform its function," he added.



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DECEMBER 2, 1957

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How to run an airline—CAB style

Board considering principles and standards in fare study that would dictate airline operations in detail

by William V. Henze

IT IS NOT generally recognized that the Civil Aeronautics Board's General Passenger Fare Investigation involves more than the question of whether fares will go up, down or remain unchanged. But while the airlines' immediate future hangs on the outcome of their fare-increase proposals, the industry's long-range future will be under the cloak of "principles" or "standards" to be set in the major case.

In short, the government, in addition to its hold over fares and rates, will be telling the airlines how many seats to have in their airplanes and when to reduce or increase schedules. This is not unlike CAB's role in the case of subsidized carriers, but it will mark the first time the agency has sought to exert its will on the actual operations of the non-subsidized industry.

The Board will exert such powers in a negative way. For example, if an airline has too few seats in a plane in CAB's judgment, it will go against the carrier in any fare or rate case. Or, if an airline's load factor drops below the CAB "standard," it will be considered over-scheduling and again weigh against the carrier in a fare or rate case.

Thus, to guard against being

placed in an adverse position in a future case, an airline generally would be expected to conform to CAB-designated seating and load-factor standards.

Add these to CAB's present control over revenue yields and you have the agency telling, in effect, (1) how much to charge for a seat, (2) how many seats to put in the planes and (3) how often to run the planes.

How would the CAB staff go about running an airline? For one thing it would take American Airlines' first-class Douglas DC-7s and put eight more seats in them. If American had thought of that in the year ended June 30, 1957, it would have made 264,200,000 more seat-miles available to the public with the same number of airplanes. The airline actually provided the public with 7.5 billion seat-miles in that year—2.5 billion of which were empty.

Likewise, United Air Lines' first-class DC-6s would have 52 seats, not 50, and UAL's DC-7s, as in the case of American, would have 68 seats, not 58. That would have added 311 million seat-miles, although United provided 6.6 billion to the public—2.2 billion of which were empty.

Trans World Airlines L-1049G Constellations would have had 68 seats

and TWA would have been able to offer 31.7 million more seat-miles for the year ended June 30. That carrier provided 5.3 billion seat-miles, of which 1.9 billion were empty.

Sixty-eight seats would also be installed in Braniff Airways' DC-7Cs instead of an average of 62. That would have added 15.7 million seat-miles for Braniff for the year ended June 30, although 540 million of the 1.3 billion offered the public were empty.

The four carriers involved thus had 7.1 billion empty seat-miles in the year tested and would pick up 622,595,000 more seat-miles by the new configuration suggested by the CAB staff.

More significant from the standpoint of overall impact on the industry, however, are proposed load-factor standards which will come out of the current case.

In this connection, the Board's staff has taken each carrier's reported system load factor for each of the years 1953 through 1956 and arrived at an average load factor for each carrier. By applying a carrier's actual load factor to the standard to be set, CAB thus would weigh whether the "quality and quantity" of service is adequate for a "representative period."

Thus, American, which estimates

Lockheed rolls out first U.S.-built commercial turboprop transport



LOCKHEED ELECTRA prototype, rolled out last month at Burbank, is being prepared for first flight, tentatively scheduled for shortly after year's end. Deliveries of the first of 141 of the turboprop transports on order will start next summer.

a 66.47% load factor in 1958, would fall below the standard suggested by the CAB staff of 68.1% which, as stated, was AA's average load factor for the 1953-56 period.

Eastern has alternate forecasts in for 1958, one of which envisions a 55.81% load factor and another 60.75%, as compared with a proposed standard of 60.1%.

Both TWA and United have forecasts well below the proposed standards. TWA estimates it will realize 64.98% as compared with a standard of 67.0% and UAL forecasts 64.18% against a proposed standard of 67.1%.

The average of the Big Four, including Eastern's most optimistic forecast, is 64.10%, as compared with an average standard of 65.6%.

For the six top regional carriers, the staff proposes an average standard of 60.7% as compared with an average forecast of 60.55%.

Rates chief to testify

In suggesting the load-factor standards, the staff is taking the position that management generally can control load factors. CAB Rates Chief Harry H. Schneider, in testimony to be given at the hearings, will state that the "proposition that passenger load factors in the domestic trunkline industry are largely controllable over reasonably extended periods is supported by the characteristics of trunk air carrier operations at the present stage of development of the industry."

Further, Schneider will testify:

"The load factor should be determined by the Board upon a conscious decision as to the quantity, quality, and nature of the services which are believed to be appropriate and most consistent with the statutory objectives with due regard for the relevant characteristics of each carrier's operations."

"As regards the general level of load factors which should be established as the objective and, accordingly, one of the most important elements determining the general level of fares, it is my conviction that such level should be reasonably high but attainable, consistent with adequate service . . ."

Schneider will add that the load-factor standards proposed by the staff are "reasonably attainable by the carriers during a representative future period."

Although the staff is thus telling the industry, in effect, how to gear its service to the public needs, it is doing so on a specific mandate from the Board. In instituting the fare investigation, CAB called for such standards.

From the standpoint of normal regulation, this would appear to be an appropriate undertaking. But with virtually the entire case turning on the issues related to the industry's move into the jet age, it will be difficult, if not impossible, to set standards for the future based on past experience.

Fare increase would build investor confidence in airlines, experts say

Leading investment bankers and financial consultants emphasized the need for investor confidence in airline securities as hearings opened Nov. 18 in CAB's General Passenger Fare Investigation in Washington. Classifying airline stocks as "speculative" and being "without sound prospects for growth or stability in market price," they termed an immediate fare increase as a "must" to avoid renewed Federal subsidies for the industry.

Hearings, being conducted by Examiner Ralph L. Wiser, are expected to run through February, and are being conducted in three stages. First stage deals with the rate-of-return issue, second with the airlines' five-year forecasts, and the third is generally considered a "catch-all" phase.

Prior to a substantial number of banker witnesses, American Airlines' president C. R. Smith led off the case as policy witness for AA. His direct testimony, circulated in advance (AMERICAN AVIATION, Nov. 18, p. 29), indicated AA's need for 40 additional jet aircraft beyond those presently on order.

In this connection, the Air Transport Association estimated that \$560 million more will have to be invested by seven of the 12 domestic trunklines for jet aircraft other than those now on order. Such an amount would be added to the \$2.1 billion to which the

industry is already committed for jets and related facilities. And, ATA points out, the added amount is a minimum, since five carriers have yet to be heard from and the other seven contemplate still further requirements.

In the face of such financial demands, Wall Street did not paint a rosy picture for the airlines' future. Benjamin S. Clark, general partner of White, Weld & Co., New York investment firm, testified: "We can only classify the industry's stocks in the speculative category. . . . Until such time as we can detect changes in the industry's economics that will result in a closer relation between revenues and profits, we will be forced to exclude the stocks from the investment category in our thinking."

Edwin H. Herzog, general partner of Lazard Frères & Company, New York, said AA will need earnings of \$25 to \$26 million annually to support financing for its jet re-equipment needs. C. R. Smith said the airline needs a 15% fare increase to produce earnings at that level.

Three additional financial experts were slated to testify also on behalf of AA in that carrier's presentation in the rate-of-return phase of the hearings. All witnesses were subjected to lengthy cross-examination by CAB Bureau Counsel George Cosson as the early pace of the hearings was slow.

Hughes may have to appear before CAB examiner to explain his relations with Northeast Airlines

Howard Hughes may have to appear at public hearings before Civil Aeronautics Board Examiner Paul N. Pfeiffer Dec. 9. If he does, it will be to give his version of details surrounding the RKO Pictures-Atlas Corp. merger in 1956 which CAB is investigating to determine if Hughes acquired control or the power to control Northeast Airlines.

The issue appeared resolved in early September when counsel for Hughes and the CAB staff signed a stipulation aimed at settling the case. That action would have placed the voting rights to 961,615 shares of Atlas stock, acquired by Hughes in the merger, in a bank or trust company. But the settlement has been tentatively rejected by Pfeiffer.

Hughes owns most of the stock of Trans World Airlines. Atlas, headed by Floyd B. Odlum, owns most of the stock of Northeast. Odlum has testified under oath that Hughes, at the time of the merger, gave him an oral proxy to vote the Atlas stock acquired by Hughes.

Pfeiffer said the evidence shows that the proxy was reduced to writing and transmitted to Hughes' attorney Thomas Slack who conducted the merger negotiations "and was opposed to the idea of such a proxy."

"Mr. Slack," Pfeiffer said, "filed the document in a Hotpoint stove box in which he stored his legal papers on his Virginia farm, to which he had retired. The document was never transmitted to Hughes and, consequently, was not signed by him."

Pfeiffer's refusal to permit settlement of the case was based on the need for further consideration of the possible "prior rights" to Hughes' holdings in Atlas that may have been acquired by Odlum.

Such consideration, the Examiner said, necessitates the testimony which only Hughes can give. At presstime, parties were preparing answers to a show-cause order from Pfeiffer as to why Hughes shouldn't appear. "If the answers are unconvincing," the Examiner added, "hearings will be resumed at 10 a. m., Dec. 9, in Washington."

Split CAB calls Trans Caribbean award 'historic'

by Donald Frederick

A CIVIL AERONAUTICS BOARD MAJORITY has taken what it describes as an "historic step" in fostering the "first transition of a supplemental carrier to certificated passenger status in a major market." Step was accomplished by the Board's vote in the Service-to-Puerto Rico Case in favor of Trans Caribbean Airlines. The vote ended 3-1, with Vice Chairman Chan Gurney dissenting and Member G. Joseph Minetti abstaining.

In reaching its conclusion, the Board agreed with its Chief Examiner, Francis W. Brown, in almost every respect. The exception: upping to five years a three-year limit on Trans Caribbean's certificate. The reason: "In our judgment, any shorter period would be insufficient to permit a fair test of the operation, and would deter the carrier from a full commitment of its resources to the route's development."

Trans Caribbean's authorization is for passengers and cargo, but not for mail. The carrier will compete with Pan American World Airways and Eastern Air Lines for nonstop business in the New York-San Juan market. It was this market which the CAB described in its opinion as "dense enough to support a third carrier which can concentrate on servicing that segment of the traffic which can move only at the lowest fares."

The majority characterized the market as one of the most heavily travelled U.S. segments. "It is a market which is not only able to support additional competition, but which is also suitable for experimentation with a new low cost service specially designed to meet the needs of a specific segment of that market," it said.

Trans Caribbean seemed more than willing to tap that segment of traffic which can only move at the "lowest fares." The airline, headed by O. Roy Chalk and represented by Washington attorney Ted Seamon, plans to launch coach service between New York and San Juan at a new low \$45 one-way fare. Big plans are also in store for the former supplemental carrier in the way of equipment. It momentarily expects delivery of the first of three 102-seat DC-6s for use over its routes. Basic schedule pattern calls for two daily roundtrips with the certificate becoming effective in mid-January.

Gurney, in his dissent, termed a third carrier in the New York-San Juan market "superfluous." He pressed two points: (1) what he termed the "excellent service" which is presently rendered on the route, and (2) the increased capacity attendant to the introduction of new jet equipment on the route by Pan Am and Eastern. "The certification of a third carrier,"

said Gurney, "could well result in deterioration instead of improving the present service. The existing carriers have aggressively promoted the market . . . under these circumstances, Trans Caribbean can hardly generate any new traffic."

The CAB Vice Chairman emphasized the seasonality of the market involved and its possible effect on Trans Caribbean. He was convinced that the carrier's equipment will be idle during the slack season and that it will be forced to look for other uses for its equipment for these periods in order to show a profit.

"Failing to obtain efficient utilization of its flight equipment," he continued, "the carrier will file a plea with the Board for strengthening, for new routes in the interior of the U.S. or in the Caribbean in order to bolster its sagging resources. Or in the alternative it will make an urgent request for subsidy."

Award to Eastern Air Lines in the case authorizes it to serve Miami as a terminal, on San Juan service, thus permitting through flights between the interior U.S. and San Juan. This refinement will allow EAL to operate from any of the points on its routes Nos. 6 and 10 without a stop in Miami. More specifically, it will permit the carrier to operate single-plane service between Chicago-Atlanta-San Juan, Chicago-Louisville-Atlanta-Jacksonville-San Juan, and Detroit-Cleveland-Charlotte-San Juan, all of which it proposed to do. In addition, Eastern has proposed flights from interior points.

The Board pointed out: "the Commonwealth contends that the increasing Puerto Rican population in U.S. cities other than New York, its business community of interest with industrial cities in the Chicago-to-New York 'hardware belt' and the actual increase in traffic between San Juan and interior points,

all point to the need for improved service to the interior U.S."

Again the CAB Vice Chairman did not see eye-to-eye with the majority. Gurney said it was his conviction that "Delta should be awarded the Chicago-San Juan nonstop authority." To support his conviction, he cited Board policy in the past as strengthening the regional trunks to prevent any return to subsidy.

"The majority," Gurney said, "departed from this policy when it failed to reserve the Chicago nonstop route for Delta rather than enhance Eastern's monopoly to the interior cities."

All the participating Board members agreed that Pan American should be authorized to serve Boston, Philadelphia, Baltimore and Washington on its Puerto Rico route, in addition to its present route (PAA presently serves San Juan on a nonstop basis from both Miami and New York). The Board commented that this award would "permit single-plane service by Pan American between these new cities and San Juan and a more direct connecting service to Puerto Rico from the areas they serve as gateways."

The only other award in the case went to Riddle Airlines and was in the form of a renewed Miami-San Juan cargo certificate. The renewal is effective until January 1961, but precludes the right to carry passengers. Member Hector, commenting on the award, did not agree with the majority, which turned down Riddle's application on grounds that it must remain an "exclusive all-cargo carrier."

"I do not," Hector maintained, "find it necessary to conclude that Riddle should remain forever an all-cargo carrier in order to deny its application herein. To my mind, the future of the all-cargo carriers is an important and difficult problem which requires careful continuing study."

Mexican airline gets its first Britannia



FIRST OF TWO Britannia 302 turboprop transports has been delivered to Aerovías de Mexico S.A. Plane is shown taking off from Bristol, England, for delivery at Mexico City. New York-Mexico City service is scheduled this month.

Capital's subsidy bid stirs opposition; independents would fly without subsidy

Capital Airlines by its request for return to subsidy status early last month may have begun an inter-airline dispute that will have far-reaching effects within and outside of the airline industry.

American Airlines' C. R. Smith took exception to this request and asked CAB's permission to appear before it to ask whether the Board thought it in the public interest to subsidize one airline at the expense of another. He pointed out that a large percentage of service operated by Capital parallels that of American and other non-subsidized carriers.

Smith said that in effect Capital was attempting to have the Federal government subsidize its operations and guarantee it a profit, the better to equip it to compete with airlines that receive no subsidy.

Smith went on to say that the Capital proposal raised a basic question of public policy. Should the Federal government allow a situation in which subsidized airlines are pitted against non-subsidized airlines? A policy of financing competition with government funds is unlikely to be fair and may result in the disruption of the sound system of air transportation the government seeks to encourage and build.

Smith emphasized that he did not oppose subsidies to communities which could not otherwise sustain airline operations, nor for essential overseas operations, but felt that there was neither the need nor the justification for subsidized airline operation between the principal traffic centers of the east, where Capital, American and other trunklines now operate and compete.

Capital heatedly replied to the American statement that its right to subsidy is governed by the appropriate provisions of the Civil Aeronautics Act, and not by the possibility that American has now decided (after availing itself of the right to subsidy for years) that the legislative provision for subsidy is no longer a completely wise policy.

Capital pointed out also that the presence of American as an intervenor in the proceeding was not required to insure that the subsidy provisions of the Act would be properly administered.

"The public interest is amply protected by other parties," Capital said.

The Capital statement went on to say that even if the Board should determine that American had the right to intervene because of its interest as a competitor of Capital, the Board should limit American's intervention to participation "only in that portion of the proceeding in which a final mail rate is to be set and which involves Capital's operations on route segments competitive with American."

Capital relies on support for this condition from the precedent set in the Seaboard & Western mail rate proceeding. American cites this same case in its petition to intervene.

Later, compounding an already complicated airline industry-government situation, Independent Airlines Association issued a statement that its member air carriers, 29 in all, with a combined fleet of more than 100 aircraft, stood ready and able to take over and fly Capital's routes without subsidy.

IAA emphasized that it had never asked for, wanted or received a penny of Federal subsidy. The association thought it significant that "once the large, route-type non-skeds were eliminated,

the certificated airlines began asking for rate increases . . ."

The IAA board further declared that, in the 19 years since the passage of the Civil Aeronautics Act, the number of certificated trunk airlines has dwindled from 18 to 12, but the total non-mail revenue has increased from \$25 million to \$2 billion in the same period. No "outsider" has ever been permitted to enter the ranks of the subsidy-protected certificated trunkline passenger carriers, IAA said.

The independents, now classified as supplemental air carriers by CAB, first got into the low-fare aircoach and air freight markets. Under present authorization they can provide unlimited charter service domestically, limited charter service overseas and ten scheduled trips a month between any pairs of points. Their equipment ranges from DC-3s up through DC-4s and Super Constellations.

Examiner opposes Pan Am-LACSA affiliation

Civil Aeronautics Board Examiner Barron Fredericks has expressed opposition to Pan American World Airways' relationship with Lineas Aereas Costarricenses, S.A. (LACSA).

Fredericks held that "continuance of the relationship between Pan American and LACSA would be attended by adverse effects outweighing any public benefits derived from the relationship." Accordingly Pan American's application for approval of the relationship should be denied, he said.

LACSA, a Costa Rican carrier, is presently owned 33 1/3% by Pan American, 33 1/3% by the Costa Rican government, and 33 1/3% by individual private stockholders. The issue is whether Pan Am has acquired control of LACSA and whether such acquisition is in the public interest.

Fredericks, in voicing disapproval, listed four principal objections to sustain his contention.

He based his first objection on the "basic possibility that U.S. mail may find its way into the support of the foreign air carrier, thus increasing the subsidy burden that falls on the U.S. government."

The Examiner acknowledged that Pan American may not now be subsidized (pending determination of that carrier's mail rate proceeding), but he feared the possibility that "subsidy will be awarded for current or future operating periods."

He also feared Pan Am's dealings with its affiliates which may have involved "inadequate charges to the affiliates for facilities provided." These charges "may have inflated PAA's claims for subsidy in past periods," Fredericks declared.

Fredericks based his second objection on the monopolistic aspects of the proposed relationship. "It involves transactions between Pan American and its affiliates made without the

protection of competitive bidding or other arms-length bargaining, conflicting in these respects with the principles of the antitrust laws and not meriting exercise of the Board's exemption power except for a compelling public-interest reason," he said.

A third reason pertained to the involvement of PAA in conflicts of interest. The Examiner maintained that these conflicts affected "its sales agency for LACSA and its dealings with that carrier, particularly in respect to sales from PAA's own inventory."

The final objection was based on the international significance of the relationship and the "tendency to embroil the U.S. in struggles between the national airlines of Central American countries."

"Only termination of PAA's interest in LACSA will relieve the U.S. government and the Board of the policing duty and the risk of becoming recurrently involved in the competitive rivalries of the Central American nations and the resultant impairment of cordial relations between the U.S. and those nations," he concluded.

Foreign airlines to lease \$10-million Idlewild base

Construction of a \$10-million jet transport overhaul base to be occupied by BOAC, Air France, KLM, Lufthansa and Sabena at New York International Airport has been approved by the Port of New York Authority.

The hangar will occupy a 50-acre site and will be completed within two years. Construction will be financed by PNYA and the airlines will hold a joint lease for 20 years.

BOAC will utilize two of the six aircraft bays, with the other carriers using one each. Building will be constructed to allow expansion to eight bays.

Record KC-135 flight awakens South America to jet age

by Anthony Vandyk

BUENOS AIRES—The dramatic non-stop flight from Massachusetts to the capital of Argentina by a Boeing KC-135 piloted by Lt. Gen. Curtis E. LeMay, has brought home to South American officials the proximity of the jet age. The USAF tanker probably did a better job in this respect than the International Civil Aviation Organization's jet planning conference in Brazil in session at the time.

ICAO has been trying for years to bring a sense of urgency to the South American governments.

Where ICAO has no power is in the field of implementation of the recommendations so laboriously formulated by its various commissions, committees and panels. Here in South America ICAO has to fight both the lack of money and a sense of urgency. The story of the development of commercial aviation in South America is largely the story of the enterprise of foreign airlines—U.S., German and French for the most part.

Most of the major airfields and a high percentage of the air navigation facilities in Latin America were built with U.S. funds. Panagra, Pan

American and the U.S. government invested billions of dollars in bringing aviation to South America.

Today many of these fields and facilities have been transferred to the countries in which they are located—sometimes by expropriation but more often by purchase. Nonetheless, the U.S. is still putting money into the development of aviation in S.A.

The financing of the construction or expansion of airports for the jet age in all probability eventually will have to come from U.S. sources. Even though most major South American airlines plan to operate jets, it is the U.S. carriers that must bring pressure on governments to hasten their preparations. There is no question that the situation is such that, unless a miracle happens, several South American countries are going to be deprived of jet service; at any rate, for several years.

The three major cities where the airport situation is most critical are Rio de Janeiro, Santiago and Lima. It is unthinkable that the governments of Brazil, Chile and Peru want their capitals to be without jet service, yet this is the way it is going to be—

unless that miracle happens.

True, at some of the critical fields jet operations with short/medium-range aircraft such as the Caravelle or Comet might be possible. At a few of them, it might even be possible to take off or land a Boeing 707 or a Douglas DC-8 with restricted load.

But it's doubtful that many operators will be prepared to accept the economic penalties resultant from inability to make full use of the aircrafts' performance.

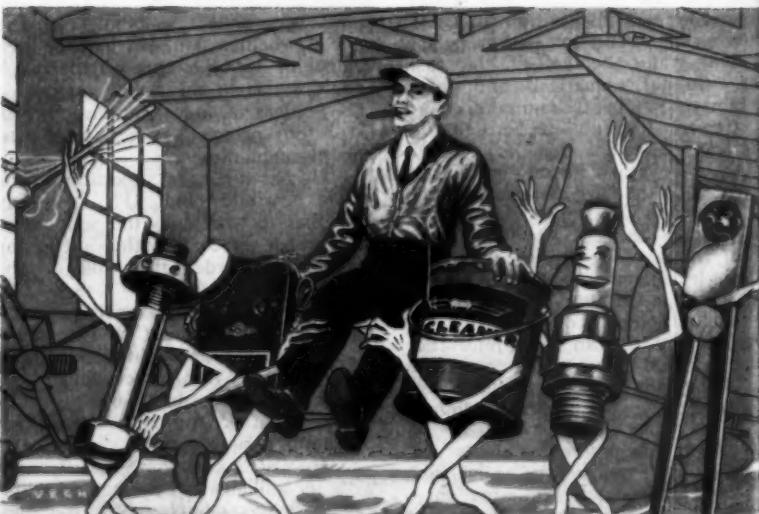
In the military area, too, South America's advance into the jet age is being retarded by lack of suitable fields and facilities. Gradually—and painfully—the majority of the South American air forces have managed to acquire some sort of jet equipment. In most recent cases, U.S. grant aid has been the instrument whereby a token number of jets have been made available. Previously jet-minded nations mainly had to look outside the Western Hemisphere for aircraft.

The result is that the South American air forces are very badly coordinated for inter-American defense insofar as jet fighter equipment is concerned. One nation has Hawker Hunters and a couple of Gloster Meteors; some have North American F-86s, other de Havilland Vampires. Individually, most of the South American air forces are pretty good; collectively, they are a pretty sad lot.

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AMERICAN AVIATION

Washington, D. C., December 2, 1957

TRANSPORT TRENDS

Subsidy bill of local service airlines may total \$35 million in fiscal 1959, according to current CAB thinking. The board estimates locals will need \$29.7 million next year, but impact of new airplanes and routes could add \$6 million to total. Airline industry's subsidy for current fiscal year will run \$40.6 million, of which \$29.7 million will go to locals.

Meanwhile, service mail pay and mail volume continue to rise. Service pay for this fiscal year will total \$69,026,000, up \$4 million from fiscal 1957. Next year it will increase another \$4 million. Mail ton-miles were up 5 million this year and will jump 10 million in fiscal 1959 to 172,592,000.

Hearings in the General Passenger Fare Investigation are scheduled to run through February, but if the present slow pace continues, they'll last from six to nine months. Even with a most expedited schedule, final decision before late summer, 1958, is highly unlikely.

The reason airlines' jet financing programs are in jeopardy is inability to impress investors. A recent extensive survey of U.S. industries puts air transport in the lowest of all categories—in with those companies that have both low and unstable earnings. Over 90% of all U.S. industries are in higher categories, emphasizing the competitive fight confronting airlines in the public capital markets.

Military's dormant program for big jet or turboprop transports may come to life under impetus of new requirement—missile lift instead of airlift. Reason: military observers feel it is impossible to move IRBMs and ICBMs from manufacturer to test point and from there to launching site efficiently with present aircraft.

Situation is emphasized by recent announcement of location of first Atlas launching site at Francis E. Warren AFB near Cheyenne, Wyo. If airlifted, Convair ICBM would travel about 2,200 miles from San Diego to Patrick AFB for testing, then another 1,630 miles to Wyoming launching site.

Look for CAB to increase substantially its budget request for fiscal 1959. Despite a record appropriation this year, CAB can't cope with many pending investigations and requests of various Congressional committees. A number of important airline cases are being deferred because Board's staff is too limited. Heaviest demands currently are those springing from General Passenger Fare Investigation and the House (Moulder) Subcommittee Investigation of Legislative Oversight.

CAB is now giving individual cities their "day in court" by sitting in private sessions with representatives of communities seeking improved airline service. Latest to be heard were Orlando, Fla., and Houston, Tex. The Houston meeting is significant because the city's bid for west coast service holds the key to a new southern transcontinental proceeding. CAB also expects an early staff report on San Francisco's request for more transcontinental nonstop service.

Capital Airlines is seeking a stretchout of the payment schedule on its fleet of Vickers Viscounts. Original agreement with British financial interests was for payment over a five-year period. This means stiff cash payments every month. As of Sept. 30, Capital still owed \$50 million and the amount due within one year of that date was \$9,044,772. Interest rate is 6 1/4%. Depreciation was running at a rate of about \$840,000 a month. Stretchout would improve poor cash position substantially.

INDUSTRY

Budget Bureau again seeks legislation forcing industry payment of user charges, special fees

Airway user charges and payments for other government services face the aviation industry as a result of a Bureau of the Budget directive to government agencies to prepare legislative proposals covering such charges.

Budget Director Percival F. Brundage asked agencies to draft legislation which would "enable them ultimately to recover full costs for government services which provide special benefits to individuals or groups, and to obtain a fair market value for the use or sale of federally-owned resources or property." Proposals are to be submitted to the Bureau of the Budget by Feb. 1, 1958.

In addition to airway user charges, this move can mean that airlines would pay the CAB for certificates of convenience and necessity, and possibly for the filing of applications, etc. There would also be charges for airmen's certificates and other documents.

President Eisenhower requested the Bureau to start action on the problem of user charges from the viewpoint of the government as a whole, in accordance with recommendations resulting from a recent interdepartmental review.

This review said the federal-aid highway program "may be considered to be on a self-sustaining basis, while the government recovers only a relatively small portion of the costs of providing airways and inland waterway navigation aids and facilities. . . .

"Many of the special benefits provided by the government service

represent hidden subsidies which have developed over the years, and, in some cases, reflect efforts which were made to stimulate an 'infant' industry or provide temporary aid to a specific segment of the population. As these benefits and subsidies continued, the recipients became accustomed to them, and now naturally oppose initiation of charges or any increases."

As examples of "special benefits," the review specifically cited CAB certificates for airline routes and airmen's certificates.

American to start jet service in January '59

Starting date of jet service has been advanced by American Airlines for the second time. New date is January, 1959. When it announced its order for Boeing 707s, AA stated that service would start in June, 1959. This was later advanced to March.

CAB authorizes new Western Air Lines service

Civil Aeronautics Board has authorized Western Air Lines to operate over a new segment between Phoenix and Los Angeles. Service will be subject to a longhaul restriction requiring flights to originate or terminate at Phoenix, on the one hand, and Seattle or Portland, on the other.

Award was voted as CAB recon-

Production 707 is readied for CAA certification program



FIRST PRODUCTION version of the Boeing 707 will make its initial flight at Renton, Wash., this month. Aircraft, scheduled for delivery to Pan American will start its CAA certification program about the end of the year. Note completely new paint job.

sidered its original decision in the Phoenix Service Case. It is in addition to a Denver-Phoenix-San Diego route granted Western in the original decision.

Vote was announced by a press release as CAB indicated a formal opinion and order will be issued at a later date.

In other actions in the same case CAB designated St. George, Utah, as an intermediate on the new Phoenix-Salt Lake City route awarded Bonanza Air Lines in the original Phoenix Case decision and also instituted an investigation to consider the needs of the Kanab-Page-Glen Canyon, Utah, area for new air service.

Chicago Helicopter Airways carried 44,000 in year

During its first 12 months of scheduled passenger service, Chicago Helicopter Airways carried 44,276 passengers, and president John S. Gleason, Jr. predicted that the 1958 total will be 110,000.

From 429 passengers in November, 1956, its first month, CHA's total has risen steadily to 7,885 in October, 1957.

Lear sells sales, service operations to Swiss firm

Lear, Inc., has sold the sales and service activities of Lear S.A. of Geneva to the Swiss firm Electravia S.A. The new firm acquired Lear's service operations in Geneva and the right to sell Lear products in Switzerland.

Lear representatives will continue to support all distributors of Lear aircraft radio and navigation products in Europe, North Africa and the Near East and headquarters for these operations will be maintained at Cointin Airport, Geneva.

CAB proposes amendment of pilot requirements

CAB Bureau of Safety has proposed amended regulations governing "recent experience" requirements for former airline pilots. Major change, designed to reflect varied types of aircraft now in use, would require that pilots in command acquire 20 hours of flight time in a particular aircraft within 60 days of the date on which he is to serve in that aircraft.

An alternative in such cases will be the passing of a flight check in the aircraft involved.

As for pilots other than those in command, CAB proposed they be required to make only two takeoffs and landings within the preceding 60 days, rather than the three takeoffs and landings within the preceding 90 days, as presently required.

Involved are proposed amendments to Parts 40, 41 and 42 of the Civil Air Regulations. Parties have until Jan. 10 to comment. Proposal is designated Draft Release No. 57-25.

More load factor needed, not more fare, says Baker

What the U.S. airlines need is "more load factor, not more fare," National Airlines' president G. T. Baker told his directors recently.

To increase fares "when business is scarce decidedly reverses a business practice of long standing," he said, adding: "My solution to the problem is to remove the 10% transportation tax . . . The war is long gone, but the tax lingers on." Removal of the tax would in effect reduce fares without reducing the level of return to the airlines, he said.

"When a merchant cannot move the merchandise on his shelves, he does not increase prices—he has a sale and reduces them. The airline business is in that position today. It is not selling the merchandise on its shelves. Certainly overall expenses . . . have increased . . . And we are still operating at fare levels set 20 years ago. A fare increase at this time would be most welcome, if it did not decrease our business."

CAB proposes revised flight-engineer requisites

CAB Bureau of Safety has proposed a revision of the Civil Air Regulations that would require an applicant for a flight engineer's certificate to have six months of practical experience in the maintenance and repair of multi-engined aircraft having engines rated at least at 800 hp each.

The proposed revision would be to Part 35, Section 31 (c) of the regulations and applies to applicants holding an engineering degree from a recognized college, university or engineering school.

All applicants would be required to have five hours of training

Fifteen years of U.S. helicopter progress



SIKORSKY'S first production helicopter, used in World War II as the R-4, is shown (foreground) with the 36-passenger troop carrier, the S-56. R-4 used a single 185-hp engine; S-56 has twin Pratt & Whitney R2800s, rated at 2,100 hp each.

in flight in the duties of a flight engineer.

Another proposed change would permit 400 hours of co-pilot time to be credited as experience, provided that time is required on an aircraft of four or more engines of 800 hp each, or the equivalent in turbine thrust.

Deadline for comment on the proposed changes is Jan. 8.

CAB proposes new rules for second pilots

CAB's Bureau of Safety proposes to amend Sec. 41.53 (a) of Part 41 of the Civil Air Regulations to require that pilots serving as second in command of a crew requiring three or more pilots be given the same periodic proficiency checks required of pilots in command.

CAA, which recommended the change, said it would insure an equivalent level of safety when such pilots are acting for the pilot in command, particularly in the handling of in-flight emergencies where the second in command must take immediate action and cannot consult with the pilot in command. Deadline for comment is Jan. 13, 1958.

Snark drops dummy H-bomb

The first Air Force missile to be fired over the full 5,000-mile Cape Canaveral, Fla., test range dropped a simulated hydrogen warhead into the South Atlantic less than five miles from the target.

The Northrop Snark was launched from Patrick Air Force Base October 21. It achieved an accuracy of better than .1% of its total range. It was independent of the ground once launched and never veered more than a mile from its plotted course.

Seaboard & Western asks freight-service extension

Seaboard & Western Airlines has asked CAB for permission to provide air freight service between the United States and Berlin, Warsaw and Moscow. S&W now operates in Europe as far east as Hamburg, Munich and Zurich.

Raymond A. Norden, Seaboard's president, said the proposed route extension would help promote better understanding between the free and the communist worlds.

Proposed service is subject first to a CAB ruling on the route extension request. U.S.-Russia bilateral arrangements would also be necessary. Currently, Pan American World Airways is the only U.S. carrier holding a certificate for service to Russia.

Examiner recommends permanency on NWA route

CAB Examiner Walter W. Bryan has recommended permanency for Northwest Airlines' certificate between the U.S. and Anchorage, Alaska. Certificate has been on a temporary basis but permanency was guaranteed by the States-Alaska Permanency Bill signed by President Eisenhower in August.

The certificate includes service between the co-terminals New York and Chicago, the intermediates Minneapolis/St. Paul and Edmonton, Alberta, Canada and the terminal Anchorage.

Favors LAA renewal

CAB Examiner Joseph L. Fitzmaurice has recommended renewal of Los Angeles Airways' helicopter certificate through Dec. 31, 1964. An attendant exemption under which LAA provides various services not listed in its certificate would be renewed for the same period under the proposal.

Lear organizes new transport group

Lear, Inc. has established an Air Transport Equipment organization containing segments of each division of the company to coordinate engineering, production, service and allied functions within the company to serve increased demands for air transport equipment.

The marketing department of the ATE group is headed by Edward P. Drake, Jr., in Santa Monica, where the executive offices and LearCal Div. are located. Lear also has operating divisions at Grand Rapids, Mich., Elyria, Ohio, and Munich, Germany.

Du Pont develops metals of unusual purity

E. I. du Pont de Nemours & Co. reports it has developed a niobium metal with unusual purity and niobium alloys possessing high strength at high temperatures for use in jet engines, missiles and atomic reactors.

Du Pont has an agreement with Thompson Products, Inc., to develop forging and other fabrication techniques for the new alloy. Du Pont will supply the alloys and coordinate its research with the Thompson development program.

Piedmont asks to serve 10 more cities

Piedmont Airlines has asked CAB to add 2,952 route miles and ten new cities to its system. Application, filed

with the Board in the newly-opened Piedmont Area Local Service Case, requests CAB to authorize service to Atlanta and Augusta, Ga.; Columbia and Florence, S. C.; Jacksonville, Fla.; Goldsboro, Rocky Mount and Elizabeth City, N. C.; Staunton, Va., and Baltimore, Md.

Piedmont currently operates 3,507 route miles.

USAF to try for record

Air Force has tentatively slated its attempt to win the Thompson Trophy with a new world's record over a measured straight course to take place between Dec. 5 and 15. This would enable the trophy presentation to be made at the Wright Memorial Dinner in Washington Dec. 17, if successful.

The speed test will be made at Edwards Air Force Base, Calif., over a measured distance of 10.1 miles, with approaches to the course on each side measuring 65 miles. The McDonnell F-101A Voodoo will make the attempt.

RCA to compete for Doppler navaid business

Radio Corp. of America will enter the competition for civil Doppler navigation equipment business.

The company said it has arranged to acquire technical information from the British Marconi Wireless Telegraphy Co. Marconi's experience in the Doppler field will be adapted to RCA's design.

Beech introduces Travel Air in 1958 line



NEW FOUR-PLACE twin-engine Beech Model 95 Travel Air has been introduced in the company's 1958 line. Price tag is \$49,500. Powerplants are Lycoming O-360-A1A, each rated at 180 hp. Other 1958 Beech prices (less equipment): Bonanza, \$24,300; Super 18, \$117,975; D50A Twin Bonanza, \$77,000; F50 Twin Bonanza, \$88,000.

Cutbacks reduce aviation employment to 885,700

Early aircraft industry effort to reduce overtime and employment following Defense Department spending cutbacks resulted in cuts of 16,300 workers, a two-hour shorter average work week and about a \$3 decline in average weekly wage.

Bureau of Labor Statistics, in its August report, found that aircraft and parts employment dropped from 902,000 to 885,700 in July and August. The production work force was reduced from 585,000 to 573,500. Average weekly wage was \$99.12 in April, \$94.60 in May, \$96.15 in August. Average work week in August was 40.4 hours.

Aircraft, missile A-power cost U.S. \$87 million in '57

Development of nuclear power for aircraft and missiles cost the Atomic Energy Commission \$86.7 million in fiscal 1957, compared with \$52 million in 1956. Construction of facilities to support aircraft and missile reactor development amounted to \$6.2 million last fiscal year, compared with \$2.4 million in fiscal 1956.

AEC gave no breakdown of amounts spent on two types of reactor propulsion systems. Objectives of AEC's program include improvements in shielding techniques, higher temperature materials and moderators, improved coolants, new methods of power conversion and increases in power density.

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President C. E. Woolman examines model of jet airliner. Delta has ordered \$100,000,000 of new aircraft. Jetliner service begins in 1959.

Golden Crown Hospitality

Another in a series on the care taken by leading airlines to maintain top flight efficiency—and why this care has led them to select CHAMPION SPARK PLUGS. Noted aviation authority reports on America's No.1 Certificated Airline, **DELTA AIR LINES...**

by HERB FISHER

I like mine rare—and I got it rare!

That's a part of Delta's "firsts." It's a part of what makes Delta different—earthy southern hospitality in the wild blue yonder.

Golden Crown Hospitality is Delta's coronation of the three regal requisites—Safety, Service and Dependability—that underlie operation of a truly successful airline.



HERB FISHER
international
aviation authority,
veteran test
pilot, author

and the Caribbean. First to provide DC-7 service to and through the South. First to provide reserve seating on Chicago-Miami nonstop service. First, as part of its Crown hospitality, to give passengers their choice of steaks—rare, medium or well-done!

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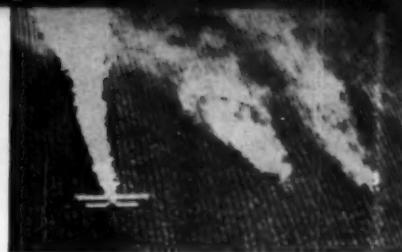
I got at the grass roots of Delta hospitality recently at the airline's Atlanta headquarters. With everyone there—from airline president to porters, from flight crews to ground crews—the passenger is prince. His safety and comfort are paramount.

"Delta operates by the Golden Rule," President Woolman said. "We simply put ourselves on the customer-side of the counter, treat our passengers as we would like to be treated. We believe an airline has a responsibility to the public over and above what's required by the price of a ticket."

Flying Scot coach flights as well as Golden Crown luxury flights have made Delta one of the most popular

passengers as it does its employees, thus daily disproving the old belief that a big company outgrows its earlier personal relationships with individuals.

Today, just as in 1924, "C. E.'s" office is open to all—new mechanic or old pilot. The president's open-door policy has made Delta a "family" organization in which each employee feels that his personal role is important in the development of his company. This policy has kept dignity in the character of Delta as well as in the individual; has fostered inherent, genuine southern hospitality; has heightened operational efficiency; has made this airline a favorite of the millions who



Delta began operations in 1924 as world's first commercial crop-dusting company.

Delta recently received an Award of Honor from the National Safety Council. It's axiomatic that the Number 1 airline in safety must be equally as high-ranking in maintenance. One manifestation of this fact is the Delta "first" in using X-ray in its aircraft overhaul inspection. Also typical of Delta's leadership in operating the finest, safest equipment is the Collins Radar Weather Eye. This radar development enables the pilot to survey his weather 150 miles ahead, guaranteeing passengers a velvet ride.

"Maintenance certainly is the crux of a superior operation," President Woolman told me. "Without good maintenance the finest pilot in the world is hard-pressed to conduct a good flight. Over the years, we've always put quality-of-maintenance in top position in our operation. We never economize in maintenance, in the quality of materials going into maintenance."

There isn't a stick-man behind a fan today who wouldn't say "amen" to that! As a long-time test pilot myself, I can swear to it.



Delta Aircraft at the Atlanta Terminal.

airlines in the nation. Royal monarchs of the skyways, of course, are those 365 mph DC-7's embossed with the Golden Crown seal of supremacy. These pace-setters for the airlines of the world are truly a Golden Crown interlude in the life of a passenger.

Delta began in 1924 as the world's first commercial crop-dusting outfit . . . graduated to transportation in 1929 with three 6-passenger Travelaires . . . today operates 74 modern transports—DC-7's, DC-6's, Convair 340's and 440's, Constellations, DC-3 and C-46 cargo planes.

Delta serves 60 cities in seven countries, covers 10,765 route-miles, flies more than a billion passenger-miles annually, employs close to 6,000 people. Employee turnover is the lowest in the aviation industry—an enviable record.

This progressive airline keeps its

enjoy its service in the United States, Cuba, Jamaica, Venezuela, Haiti, Puerto Rico and the Dominican Republic. It has helped boost Delta from "firsts" as a pioneer airline to "firsts" in its present stature among the nation's largest airlines.



Examining heart of powerplant, the ignition system (l/r): Larry Watson, Powerplant Gen. Foreman; Fisher; L. W. Carlton, Gen. Foreman; Dean Miller, Specialist Group Supervisor.

Vice-Pres. C. H. Dolson and President C. E. Woolman (l/r) show Fisher the original No. 1 Airline Operating Certificate issued by C.A.A. Delta received it Aug. 22, 1938.



Charles H. Dolson, Vice-President—Operations, said it for me as I probed the heart of Delta's operation there at Atlanta: "Just as maintenance is never-ending, so is

At this Atlanta overhaul base, I saw firsthand Delta's consummate efforts to provide passengers with the very best in safety, service and dependability. I was struck by the

of Overhaul, showed me the intricacies of the operation that now gives Delta a daily utilization of 11 hours on aircraft that formerly lent themselves to only six hours' utilization per day.

"I've had experience at digging into the reasons for engine trouble," Mr. Carlton said, "and I can truthfully say that only in very rare cases can you rightfully blame the trouble on spark plugs. When an engine starts to cough or backfire, first thing many airlines want to do is change spark plugs."

Mr. Carlton told me about the causes of engine trouble that Delta has turned up—none of them having anything to do with the vital heart of the Delta aircraft ignition system, the Champion Spark Plug.

"Matter of fact," he added, "I've had a set of second-hand Champions in my own 65-hp Aeronca since 1952—over five years!—and they're still running perfectly. Sure, I fly 'em! I fly to and from work—I depend on those spark plugs to get me there on time, too—and, in checking my log book recently, I found I'd cleaned those spark plugs just once and have a grand total of 760 hours on them. Furthermore, they're still good!"

Referring back to Delta's 13-year use of Champions, Mr. Carlton said: "We ought to tie our Delta slogan, 'There's No Compromise with Safety,' to the Champion slogan,



Southern hospitality from the heart makes for lasting friendships. It's a Delta tradition. Sky Lounge of this DC-7B is warmly decorated in tan, white, aqua and gold.

evaluation and re-evaluation of all airline methods, procedures, processes, materials and accessories. Vital aircraft equipment undergoes extensive, exhaustive testing and re-testing here.

"Such is it with Champion Spark Plugs, for example. Delta has been using Champions since 1944."

painstaking attention to detail throughout Delta maintenance.

Overhaul is done in 24 shops on a progressive or block basis, thus providing lower downtime on fewer aircraft over shorter periods... and more available aircraft during peak traffic periods.

Lewis Carlton, General Foreman

Champion Spark Plugs, typical of Delta's use of only the very finest in aircraft parts and equipment, are being gapped by Delta mechanic H. L. Mang.



Delta flight crew chatting before takeoff (l/r): 1st Officer E. N. Thomas, Stewardess Nancy K. Shiels, Capt. James Dalton, 2nd Officer Eugene Caverly, Stewardess Betty J. Brantley.



Economics of the Delta Air Lines operation are discussed by (l/r) Fisher; K. T. Wilson, Purchasing Agent, and W. H. Hobbs, Buyer for Delta's Purchasing Department. "Champion maintains a high-quality product at reasonable cost," Mr. Hobbs reported. "With Champions, Delta achieves dollar economy in long life as well as in dependability," Mr. Wilson said.

Advertisement

'Dependable Safety,' and make it: 'There is No Compromise with Dependable Safety.'"

And there is no compromise when the life-beat of the aircraft heart depends on Champions. That was the feeling I found shared by all technicians, specialists and supervisors in Delta's maintenance and overhaul operation — an operation

able, trouble-free spark plugs available today." He credited Champion with having helped Delta attain and maintain its present stature as a top airline in efficiency and dependability.

The purse-string holders in any business are the centrifugal forces of decision. Yet in the airline business economy is measured as much

product makes it possible for Delta to carry a minimum inventory of spark plugs and, hence, keep its dollar investment at the lowest minimum.

"We've never had any delivery difficulty—and we've never received a spark plug shipment containing rejectable material," said W. H. Hobbs, Buyer for Delta's Purchasing Department.

Champion has thus contributed to Delta's tripodod success in Safety, Service and Dependability . . . and Delta has firmed its top position among big airlines with a monumental base of southern hospitality.

"This is just the beginning," Operations Vice-President Dolson reported: "We have on order right now over one hundred million dollars worth of new aircraft — more DC-7's plus DC-8's and Convair 880's — 18 four-engine jet airliners.

"Here's a sample flight schedule we plan to have in effect within two years:

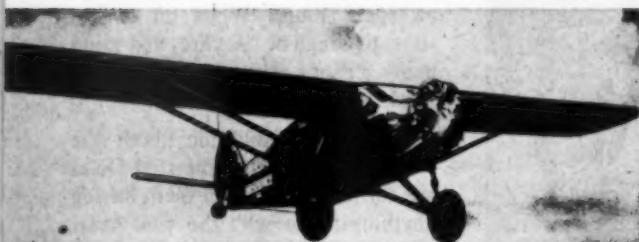
"Chicago to Miami — two hours, 25 minutes.

"New Orleans to Chicago—one hour, 54 minutes.

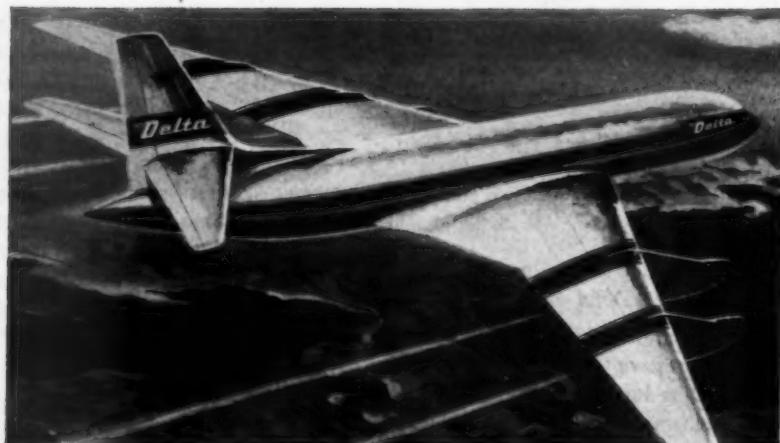
"Atlanta to Dallas—one hour, 37 minutes.

"Houston to Washington—two hours, 40 minutes.

"Atlanta to New York—one hour, 36 minutes."



The Dim Past — A 6-passenger Travelaire in flight in 1929, Delta's first year of passenger service.



The Immediate Future — This 600-mph Delta jetliner will be in service in less than 2 years.

that today includes more than 50 majors a year.

"To achieve greater service life on an engine and its components, Delta is always receptive to service tests of other equipment," Dean Miller, Delta Specialist Supervisor, told me. "A vendor's product must meet our own rigid standards as well as those of the appropriate government agency. Champions meet our rigid test standards and experience requirements."

Larry Watson, Delta Powerplant Overhaul General Foreman, knows ignition systems and spark plugs inside and out. He referred to Champions as "the most depend-

able by dependability as by dollars and cents. "We don't buy solely on a price basis, but rather on a basis of what's the best product to accomplish the purpose at hand," K. T. Wilson, Delta Purchasing Agent, told me. With Champions, Delta achieves dollar economy in long life as well as in dependability.

"My constant aim for Delta is to secure the right materials in the right quantities at the right time and at the right price to support an efficient and economical operation," Mr. Wilson said. The record indicates Champion has been right for Delta these past 14 years. Champion providing a short lead-time on its



Discussing Delta's top safety record (L/R): C. B. Wilder, Technical Operations Director; Fisher; A. C. Ford, Engineering Superintendent; G. J. Dye, Maintenance Superintendent.

And you can bet there'll be more *firsts* for the airline-with-a-heart when Golden Crown Hospitality spans the skies on jet wings.



SIPPRELL



MADIGAN



ARTHUR



GILLHAM



BRENTNALL



REICHEL

Manufacturing

Name	New Position	Former Position
William A. Sipprell	Pres., The Babb Co., Inc.	Pres., Cleveland Welding Co.
Dr. J. R. Madigan	Chief engr., Hoffman Semiconductor Div., Hoffman Electronics Corp.	Physicist, Research Dept.
Dogan H. Arthur	VP-sales, Titeflex, Inc.	Aircraft sales mgr., Aeroquip Corp.
Hugh I. Gillham	Chief engr., Trecker Aircraft Corp.	Sr. design engr., Lockheed-Marietta
Major Gen. Samuel R. Brentnall	Managerial consultant and member pres.'s staff, A. O. Smith Corp.	Asst. AF Chief of Staff for Guided Missiles
Wladimir A. Reichel	Sr. vp, Norden-Ketay Corp.	Sr. vp-engr., General Precision Equipment Corp.
Jackson K. Lightfoot	Chief engr., Missile Products Div., Beckman & Whitley, Inc.	Chief engr., Omark Industries
Dr. Jobe Jenkins	Mgr. communications dept., weapon system tech. div., Lockheed's Missile Systems Div.	Staff scientist, Palo Alto labs.
Frank H. Robbins	Dir. development and production engines, Westinghouse Aviation Gas Turbine Div.	Mgr. development engines
Robert M. Flanagan	Asst. chief engr., Stratoc Div., Fairchild Engine & Airplane Corp.	Project engr.
Leonard M. Clark	VP, Snap-Tite, Inc.	Sales mgr.
George F. Hagger	VP-engr., Snap-Tite, Inc.	Dir. engr.
Frederick H. Greene, Jr.	VP, National Research Corp.	Dir. Commercial Development Dept.
George F. McCarthy	Gen. Sales mgr., Bowmar Instrument Corp.	Mgr. representative
Frank W. LaVista	Retired	VP, Liberty Aircraft Products Corp.
Clifford C. VanderWall	Asst. gen. mgr., Ansul Chemical Co.	Dir. mfg.
McLain B. Smith	VP, IBM Data Processing Div.	Dir. plans and control
John E. Holden	Admin. engr., Chandler-Evans Div. of Pratt & Whitney Co., Inc.	Admin. asst., Reaction Motors, Inc.
Crump Smith	Mgr., institutional and export adv., IT&T	Mgr. adv. & sales promotion, Federal Telephone and Radio Co.
Arthur C. McCarroll, Jr.	Dir. division and field relations, IT&T	Head information services, Detroit
Samuel J. Childs	Group exec., American Machine & Foundry Co.'s Defense Products Group	VP and gen. mgr., Weston Electrical Products Corp.
Christian J. Goodman, Jr.	Product sales mgr., GE Semiconductor Products Dept.	Dist. sales mgr.
R. B. Moon	Mgr. West Coast Branch, Filters, Inc.	Asst. gen. sales mgr., Bendix Radio Div.
Dorothy P. Vogel	Plant mgr., Colvin Laboratories, Inc.	In chg., production and planning dept.
V. L. Bradford	Pres., Milford Rivet & Machine Co.	Exec. vp
John Baur	Dir. engr. & research, Binka Mfg. Co.	Engr.
George J. Parker	Gen. mgr., Norden-Ketay's Florida Gear Div.	VP, Daystrom, Inc.
Fred Thearie	Chief engr., Transland Co.	With North American Aviation
James H. Jarratt, Jr.	VP and sales mgr., Van Zelst Associates, Inc.	With The Martin Co.
Frederick H. Guterman	VP, Allen B. Du Mont Laboratories, Inc.	Asst. vp, American Bosch Arma Corp.
John M. Embree	Applications mgr. and asst. to pres., Mid-Century Instrumental Corp.	Project engr., Curtiss-Wright
George Habicht, Jr.	Pres., Southeast Machinery Co.	Bd. chm., Marshall and Huschart Machinery Co.
A. L. "Larry" Stone	Sales mgr., western region, Aero Hydraulics Div., Vickers, Inc.	Application engr.
John K. Mumford	VP-ind. rel., SPACE Corp.	With FBI
Mason J. Hamilton	VP-operations, SPACE Corp.	With CBS-Hytron
Rudolph Sachs	VP, Diode Div., General Transistor Corp.	Supv. engrg. analysis group
Thomas J. May	Chief engr., Commercial Div., Weber Aircraft Corp.	Chief engrg. personnel admin.
E. R. (Gene) Mitchell	Mgr. ind. rel., Temco Aircraft Corp.	Exec. staff asst., Convair
H. C. "Spike" Deckard	Asst. to pres., Altronics International Corp.	With North American Aviation
Dr. Clement J. Savant, Jr.	Dir. engrg., American Electronics, Inc.	Douglas Aircraft Co.
Vern Landis	Sales mgr., Ta-Mar, Inc.	Chief analytical engr.
Heribert G. Somerson	Chief tech. engr., Piascicki Aircraft Corp.	Sales engr.
Charles Z. Becker	Mgr. engr. and customer rel., Western region, Chicago Aerial Industries, Inc.	Asst. sales mgr.
Fred H. Angier	Sales mgr., Hydraulics Div., Daimo Victor Co.	Pres.
J. N. Collins	Chm. bd., Valvair Corp.	Exec. vp
W. F. Kruspe	Pres. and gen. mgr., Valvair Corp.	Chief engr., design group, Pratt & Whitney
Carl N. Furay	Head design engrg. field service, Howard Foundry Co. (Southeast)	Aircraft
John Higginson	Gen. mgr., Thiokol Chemical Corp., Utah facility.	Gen. mgr., Elkton Div.
Robert G. Hoch	Materials and new products mgr., Texas Instruments Inc. Semiconductor-Components Div.	Mgr. service engrg., Apparatus Div.
Sam A. Wilburn	Dir. commercial aircraft div., Southern California Aircraft Corp.	VP, Pastushkin Aviation Corp.
William F. Cords	Dir. sales, Pachmayer Corp.	Solar Aircraft Corp.

Airline

Alwin W. Johnson	Exec. vp, Slick Airways, Inc.	Chm. bd. of directors
Richard W. Gilbert	Sr. vp, Eastern Air Lines	Mgr. cargo sales
Robert J. Norris	Resigned	Treas. and Secy., Alaska Airlines, Inc.
Million W. McQueen	Treas., Standard Fruit and Steamship Co.	Asst. treas., Trans World Airlines
Haynes Batey	Dir. stores and material control, National Airlines	Supv. material control
Robert E. Hilliard	Treas., Transocean Air Lines	Comptroller
Stanley R. Kochenderfer	Secy., Transocean Air Lines	Dir. of operations
Robert J. Sherer	Treas., Bonanza Air Lines	Asst. treas.
William M. Crilly	Asst. to the pres., Hawaiian Airlines	Partner, Planning Research Corp. of Los Angeles

The General Motors Matched Power Team of Allison Prop-Jet Engines and Aeroproducts Turbo-Propellers is Proving its Jet-Age Durability in Round-The-Clock "Operation Hourglass"



MODERNIZED TRANSPORT SETS 1000 HOUR FLIGHT ENDURANCE GOAL — Leased from the U. S. Air Force specially for "Operation Hourglass" this modernized YC-131C — military version of the popular Convair 340—is daily logging hours in a round-the-clock, round-the-country flight endurance program unprecedented in the field of modern prop-jet power. Duplicating a cross section of commercial and military transport schedules, "Operation Hourglass" proves with every hour the superior performance and economics of Allison Prop-Jet Power. Currently in production for the new Lockheed Electra and now available for modernization of existing transport aircraft, the matched team of Allison 501 Prop-Jet Engines and Aeroproducts 606 Turbo-Propellers is rapidly establishing itself as a versatile and dependable power plant for commercial and military jet-age transportation.



ALLISON PROP-JET POWER

ALLISON DIVISION OF GENERAL MOTORS, Indianapolis, Indiana





WEST COAST TALK

by Fred S. Hunter

Convair 440 doing well for 'speculative' venture; Rohr moving along on 707 fuselage contract

MOST OF THE TALK in transport aircraft circles these days centers around big airplanes of high performance. For a change of pace, let's consider a useful, medium-size airplane of moderate speed that turned a three-plane speculation into a \$100-million success story—the Convair 440. With the three-plane order from Continental Air Lines, Convair went into production on 12 airplanes, nine on speculation. The 440 has been a program of speculation ever since. It still is, as a matter of fact, as Convair has programmed production of 21 airplanes on which it is still negotiating sales. But when the aircraft phases out in April, the total number of 440s sold will add up to 196. And that, my friends, is a sizable volume in anybody's league.

Rohr's deadline for delivery of its first aft fuselage section for the Boeing 707 is Dec. 12. It's for the No. 4 airplane on the Boeing line. Rohr moved into this program on Aug. 8 after Boeing decided Ryan Aeronautical had too big a load to carry in producing these big fuselage sections both for the military KC-135 and the commercial 707, and split the job. The unit assigned to Rohr under a \$13-million contract is the 43-foot "46" section, which includes 36 windows and two plug-type cargo doors. About 510 sub-assemblies are made into 23 major assemblies to complete the section, and this involves about 4,000 different detail parts and 10,000 different tools.

Nearly all of the employees engaged in DC-8 assembly at Douglas-Long Beach were selected from other sections of the plant for transfer to the jet project and have had a minimum of five years experience in complex structural assembly and subassembly. The No. 1 DC-8, now moving along the final line, will be used as the company's own test airplane. Nos. 2, 3 and 4 are slated for United, 5 and 6 will be the first for Pan American. No. 5 will be the first plane in which the bigger JT4 (J75) engines will be installed.

Standard Oil Co. of California's hangar at San Fernando International Airport is not exactly an architectural masterpiece, but this would not seem to be the reason it carries no sign or marking to identify it as the property of the oil company. This unique sense of modesty also extends to the com-

pany's turboprop Viscount executive, which is devoid of any exterior indication of its ownership.

Continental Air Lines will get its first Viscount 840 in February—ahead of schedule—but is sticking to its original plan to await the start of summer schedules, April 27, before putting the new turboprops into service on the Los Angeles-Denver-Chicago run. With the Viscounts, CAL will charge standard fares for the first time on this route. Coach tariffs prevail for its present DC-7B schedules.

Burck Smith of American Airlines is cooking up a deal to have Boeing's William M. Allen make a speech before the Aero Club in Los Angeles in February, and the affair undoubtedly will attract a big attendance from Santa Monica . . . Charles S. Wagner, manufacturing manager at Lockheed, has been elected chairman of the aircraft production forum for 1958 by the Society of Automotive Engineers . . . Pan American now has 400 employees based in Honolulu, which shows you how airlines keep growing in the Pacific.

Overheard in Leavitt's in Dayton by Marquardt's Paul Papanek: "I finally qualified for my need to know, and now all I have to do is find out who to ask."

Capt. Jack Rush, Seattle-based Pan Am captain, flew a military charter to Newport News, Va., and, then, with crew and airplane, impatiently awaited a return trip, after PAA was unsuccessful in bids on three westbound flights. Finally, in desperation, Rush wired scheduling in San Francisco as follows: "Have DC-4, will travel." Fortunately, for the skipper's peace of mind, PAA lined up a trip from Oklahoma City to San Diego about the same time he sent the wire.

Phillips Petroleum is the second company to place an advance order with On Mark Engineering for a "Marksman 450" turboprop executive. On Mark expects to have its first airplane ready to fly in May.

Santa Clause, Inc. is the name employees of the San Bernardino Air Materiel Area give their Christmas charity. Last year they collected, repaired or made 2,000 toys for needy kids for Christmas.

Jeppesen Gifts Make a Merry Christmas

AND provide flying safety
and convenience all through 1958

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—direct answers at all speeds, all altitudes; 4 1/4" Pocket, \$8.70—6" Navigator, \$11.70.



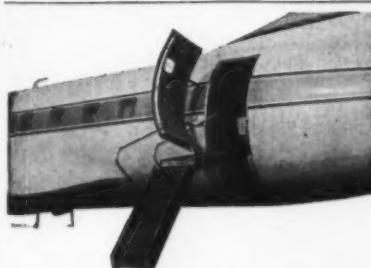
Flight Cases

—three models engineered for use in the cockpit; shown, "The Exec" model, \$24.75 including tax (gold imprinting available).

On sale at most airports, or write
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The aft-mounted retractable stairway pictured above, installed by PAC in an executive Convair 240 for long-time customer Murray Corporation of America, is a concrete example of Pacific Airmotive's expert performance in all phases of aircraft modification and maintenance.

First assembly of its kind ever built for a Convair 240, the stairway was designed, fabricated and installed by PAC in only nine weeks. Major engineering problems were successfully solved under deadline conditions.

Corporate or airline operators with difficult or unusual problems demanding superior engineering and production skills look first to Pacific Airmotive. From Bonanzas to DC-7s, PAC's "one-stop" service means one stop at one location for any type of work on airframe, engines, propellers, accessories, radio, instruments or cabin interior, with all items coordinated to get the job out on schedule.



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The Hoover Dam, one of the world's outstanding engineering achievements stands mid-way between Nevada and Arizona, bringing control to turbulent waters of the Colorado River.

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High cost of carelessness

A major airline reports avoidable damage occurred to 129 of its aircraft and 71 pieces of ground equipment during the first six months of this year. These accidents delayed 1,490 passengers and 76,527 pounds of cargo a total of 71½ hours, and resulted in loss of 49 passengers and 18,678 pounds of cargo to other carriers. Aircraft damaged were out of service 929 hours.

A study showed that 60% of damaged aircraft cases resulted from employees failing to follow established procedures; 80% of the damaged ground equipment was attributed to the same cause.

Supersonic windburn

A new problem comes up in windblast studies related to high-speed bailouts—severe air friction burns of skin areas not covered by protective clothing. Speeds in excess of Mach 1 have been reached in rocket-sled runs with little effect on subjects as long as the protective clothing lasted. But wind pressures at these speeds cause rapid deterioration of conventional fabrics and some new approaches in materials will soon undergo tests.

Also in orbit: the Pentagon

One jokester put it this way: "There are now three objects flying around up there—Sputnik I, Sputnik II and the roof of the Pentagon."

Scramble for OAG spot

Airlines in Chicago are scrambling to get pictures of their sales personnel in the advertisements that Hertz Rent A Car is now running on the cover of *Official Airline Guide*. First ad (November) featured Polly Papenagen, American Airlines agent in Chicago, who "reserves Hertz cars to solve passengers' destination problems." Hertz plans to use Chicago airline personnel in the ads, which are attracting considerable attention.

\$50,000 house for a mechanic

TWA President Carter L. Burgess estimates it would cost his company \$14 million more to do business this year if it produced only the same volume of traffic as last year. For example, payroll is up 24%, gas and oil prices 28%. Here's one small item he cites: It cost TWA \$50,000 to buy a house for one of its mechanics and have it shipped to Frobisher Bay on Baffin Island, the fueling stop for the airline's new polar route between the West Coast and Europe.

It's a special house, of course. The roof is aluminum, there are three layers of glass in the windows and it is built to withstand winds of Arctic velocity and temperatures as low as 40° below zero.



"Just a little precaution that we take on the Pay Later Plan, Mr. Finchley . . . Now say 'Flight 99' once more and cough."—Courtesy *Trans-Canada Air Lines*.

Wifely reaction to strike

During the National Airlines strike in October, the wife of Capt. Jack Pitts

was interviewed by the *Miami Daily News*. Among the quotes as reported: "If he was away most of the time and then stayed home, I suppose it would make a difference," she said. "But he only flies eight to ten days out of a month. Since he's home so much, the little extra time wasn't noticeable." End quote.

Qantas supplies everything

Down in New Guinea Qantas Empire Airways supplies towns and villages up in the highlands with just about everything. One town has roads and cars and trucks, but the highway to the seacoast is almost impassable. So Qantas transports motor fuel in rubber bags, 220 lbs. of fuel to the bag, and four bags to a Beaver trip. Expensive transportation but not when the airplane is the only way to get it there.

Old Empire route going strong

One of the earliest local airlines was Empire, serving the sparse territory east and west of Boise, Idaho. After struggling the hard way, it was merged into West Coast Airlines. Today, with its relatively high per-mile fare and longer distances, the old Empire route is about the best segment in the entire WCA system.

AVAILABLE FOR LEASE

Two New Convair "440's"

(Total time—7 hours)

These planes are fully equipped for immediate airline operation.

Interior Arrangement—52 passenger seats, 2 stewardess seats, buffet by Associated Pacific

Engines—Pratt and Whitney R2800-CB17

Radar—Bendix RDR-1B

Autopilot—Sperry A-12 with auto-approach

Radio—Complete VHF Navigation system, radio compass (ADF) system, marker beacon system, ILS system, HF Communication system, VHF Communication system, interphone system, PA system.

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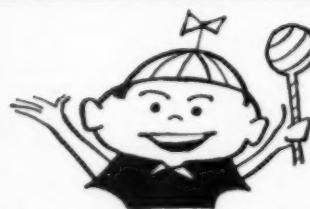


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these Buffet Inserts
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bumping, kicking, jar-
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Circle No. 19 on Reader Service Card.

Summary of U.S. airline revenues, expenses for 3rd quarter, 1957 vs. 3rd quarter, 1956

Compiled by American Aviation Publications from Official C.A.B. Data

Airlines	Total Operating Revenues			Passenger Revenues			Total Operating Expenses			Net Operating Income			
	1957	1956	% Change	1957	1956	% Change	1957	1956	% Change	1957	1956	% Change	
DOMESTIC													
American	\$78,224,796	\$75,500,779	3.6	\$70,022,262	\$67,907,960	3.1	\$72,161,992	\$63,402,661	13.8	\$6,062,804	\$12,098,118	-49.9	
Braniif	14,074,952	11,124,567	26.5	12,900,166	10,159,947	27.1	12,941,447	10,435,254	24.0	1,133,505	689,313	64.4	
Capital	25,486,494	17,357,738	46.8	23,911,379	16,341,395	46.3	25,094,072	17,940,207	39.9	394,422	-82,469		
Continental	6,636,028	4,737,923	40.1	6,154,491	4,267,721	44.2	6,303,304	4,331,847	45.5	332,724	406,076	-18.1	
Delta	18,794,871	15,936,851	17.9	17,079,305	14,545,526	17.4	18,215,527	15,079,016	20.8	579,344	857,835	-32.5	
Eastern	53,982,455	48,491,288	14.4	52,622,833	45,808,615	14.9	55,621,183	47,122,779	18.0	361,362	1,818,503	-80.1	
National	NA	10,361,763	NA	9,252,575	NA	NA	9,624,639	NA	NA	737,124	NA	NA	
Northeast	4,885,233	3,357,729	45.5	4,613,650	2,927,759	57.6	5,764,947	3,040,616	89.6	-879,550	316,409		
Northwest	15,990,363	14,606,065	9.5	14,434,258	13,232,908	9.1	14,275,059	12,374,253	15.4	1,715,304	2,231,812	-23.2	
TWA	56,563,486	47,773,665	18.4	52,595,254	44,013,513	19.5	53,694,994	45,369,389	18.4	2,868,492	2,404,267	19.3	
United	76,880,535	69,654,281	10.4	68,401,015	61,904,136	10.5	67,279,653	58,394,614	15.2	9,600,882	11,259,667	-14.7	
Western	NA	9,622,711	NA	9,039,140	NA	NA	7,790,299	NA	NA	1,832,412	NA	NA	
TOTALS	353,521,467	328,974,856	7.5	322,734,608	299,400,724	7.8	331,353,178	294,905,583	12.4	22,169,289	34,069,073	-34.9	
INTERNATIONAL													
American	1,643,285	1,640,618	0.2	1,352,223	1,353,643	-0.1	1,421,890	1,332,760	6.7	221,395	307,855	-28.1	
Braniif	2,353,414	1,998,597	17.8	2,052,842	1,459,200	40.7	2,165,592	1,588,356	36.3	187,822	410,241	-54.2	
Delta	1,746,549	1,397,601	25.1	1,618,085	1,294,106	25.0	1,428,083	1,148,449	24.3	318,466	249,152	27.8	
Eastern San Juan	4,427,572	4,543,976	23.4	4,093,207	716,011	4,172,305	25.1	4,527,970	3,429,617	39.4	615,959	302,219	1,114,359
Bermuda	755,189	422,306	NA	410,463	NA	NA	515,403	NA	NA	-93,097	NA	NA	
Mexico	NA	799,778	NA	747,590	NA	NA	930,614	NA	NA	-130,836	NA	NA	
National	8,171,136	7,261,536	12.5	5,635,220	4,663,083	20.9	6,347,472	5,970,837	6.3	1,823,664	1,290,699	41.3	
Northwest	5,229,004	5,030,136	4.1	3,804,849	3,823,419	-0.5	4,900,393	4,630,110	5.8	328,611	400,026	-17.9	
PAA	Lat. American	25,819,187	23,785,554	8.5	19,767,831	17,479,554	13.1	24,644,137	21,496,858	14.6	1,175,050	2,288,696	-48.7
Atlantic	41,232,632	39,248,861	5.1	35,274,113	33,242,900	6.1	32,816,684	30,897,966	6.2	8,415,948	8,350,895	0.8	
Pacific	22,119,872	19,541,815	13.2	16,821,048	14,879,772	13.0	19,073,391	15,993,782	19.3	3,046,481	3,548,033	-14.1	
Alaska	1,782,814	2,251,525	-20.8	1,478,945	1,506,518	-1.8	2,113,602	2,182,768	-3.2	-330,788	68,757		
TWA	23,277,591	21,646,004	7.5	19,853,188	18,225,251	8.9	19,209,787	17,888,489	7.4	4,067,804	3,757,515	8.3	
United	4,695,401	4,273,559	9.9	4,470,426	4,095,198	9.2	3,370,068	3,018,762	11.6	1,325,333	1,254,797	5.6	
Western	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
TOTALS	143,675,952	133,419,560	7.7	117,348,451	106,942,539	9.7	122,271,085	110,509,368	10.6	21,404,867	22,910,192	-6.6	
* Inaugurated service to Mexico City, July 15.													
LOCAL SERVICE													
Allegheny	2,197,039	1,796,940	22.3	1,567,534	1,300,465	20.5	2,244,265	1,864,357	20.4	-47,226	-67,417	...	
Bonanza	892,048	776,209	14.9	507,009	416,444	21.7	947,084	736,273	28.6	-55,036	39,936		
Central	NA	862,607	NA	NA	305,070	NA	NA	838,095	NA	NA	24,512	NA	
Frontier	1,683,106	1,582,419	6.4	988,840	824,390	19.9	1,386,551	1,329,642	3.7	96,555	52,777	82.9	
Lake Central	925,801	709,746	30.4	433,212	349,852	23.8	907,416	705,513	28.6	18,385	4,233	334.3	
Mohawk	NA	1,389,930	NA	NA	1,123,777	NA	NA	1,547,262	NA	NA	-157,332	NA	
No. Central	NA	2,229,934	NA	NA	1,845,550	NA	NA	2,161,236	NA	NA	68,709	NA	
Ozark	1,960,146	1,482,632	32.2	1,174,367	850,141	38.1	1,970,186	1,619,808	21.6	-10,040	-137,177		
Piedmont	2,246,146	2,138,430	5.0	1,483,900	1,337,337	11.0	2,085,810	2,022,256	3.1	160,336	116,174	38.0	
Southern	1,147,518	972,815	18.1	592,406	503,741	17.6	1,153,564	1,021,598	12.9	-6,046	-48,783		
Southwest	NA	1,479,013	NA	NA	885,687	NA	NA	1,337,533	NA	NA	141,480	NA	
Trans-Texas	1,738,147	1,467,160	18.5	875,557	805,011	8.8	1,644,470	1,582,526	3.9	93,877	-115,366		
West Coast	1,142,010	1,053,780	8.4	709,179	596,681	18.9	1,120,689	958,317	16.9	21,321	95,463	-77.7	
TOTALS	13,931,961	17,941,626	-22.4	8,332,004	11,144,146	-25.2	13,660,035	17,924,417	-23.8	271,926	17,209	1480.1	
ALASKAN													
Alaska-States	475,253	521,393	-8.9	100,772	136,243	-26.0	517,648	480,013	7.8	-42,395	-41,380	...	
Intra	941,587	1,221,738	-22.9	394,579	401,895	-1.8	987,385	1,078,373	-8.4	-45,798	143,365		
Alaska Coastal	462,005	443,856	4.1	252,628	247,937	1.9	378,575	346,368	9.3	83,430	97,488	-14.4	
Cordova	NA	537,940	NA	NA	53,995	NA	NA	458,000	NA	NA	79,939	NA	
Ellis	339,926	335,598	1.3	203,166	180,549	12.5	284,431	249,344	14.1	55,495	86,254	-35.7	
No. Consolidated	641,440	898,718	-28.6	269,927	293,044	-7.9	614,756	815,297	-24.6	26,684	83,421	-68.0	
Pacific Northern	2,966,253	3,620,902	-18.1	2,219,444	1,929,040	15.1	3,585,840	2,322,063	11.4	280,413	1,298,839	-70.7	
Reeve	517,660	364,617	42.0	340,511	178,787	90.5	383,842	249,632	52.8	133,818	114,985	16.4	
Wien Alaska	1,282,508	1,862,649	-31.2	386,925	354,972	9.0	1,190,523	1,782,212	-33.2	91,985	80,436	14.4	
TOTALS	7,626,632	9,807,411	-22.2	4,167,962	3,776,462	10.4	6,943,000	7,781,302	-10.8	683,632	2,026,107	-66.3	
TERRITORIAL													
Caribair	491,383	375,001	31.0	446,250	332,489	34.2	432,870	333,157	20.9	58,513	41,844	39.8	
Hawaiian	1,816,294	1,583,271	14.7	1,557,268	1,300,590	18.7	1,580,948	1,381,145	14.5	235,346	202,126	16.4	
Trans-Pac.	824,948	712,588	15.8	756,621	651,807	16.1	728,521	630,374	15.5	96,427	82,214	17.3	
Chi. Helicopter	351,878	128,041	174.8	98,180	NA	NA	415,362	133,997	209.9	-63,484	-5,956	...	
Los Angeles	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Airways	342,987	261,685	31.1	52,751	36,537	44.4	298,783	262,629	5.7	44,204	-20,944	...	
N. Y. Airway	NA	443,178	NA	NA	87,987	NA	NA	482,878	NA	NA	-39,700	NA	
NA: Not available.													
TRANSPORT CHANGES													
Carl R. Hottel appointed gen. sales mgr. for ASA International Airlines (formerly Aerovias Sud Americana).													
Francis M. Meier named mgr. of Mohawk Airlines station at Keene, N. H.													
Daniel G. Ellyn promoted to representative in sales dept. of Guest Airways Mexico.													
Walter A. Peto appointed New York station mgr. for Northeast Airlines.													
Robert Karlstein has been put in charge of commercial and executive accounts for the garment area, a sales div. of the New York area, Northeast Airlines.													
Harold Swift named Pan American World Airways' dir. and district traffic and sales mgr. at San Juan, Puerto Rico.													
Klein Mitchell named resident representative for Pan American World Air-													
ways, at Boeing Airplane Co.'s Transport Div., succeeding Richard Adams, who becomes maintenance mgr. of PAA's Atlantic Div., based at Idlewild Airport.													
Edward Carroll appointed district sales mgr. for Trans World Airlines at Basra, Iraq.													
Dennis R. Kelley named Dist. sales mgr. for Northwest Airlines in Cleveland.													
Thomas V. Sayers appointed mgr. of Transocean's New York office.													



New Dallas Love Field Terminal area: Aerial view shows layout of new terminal building, with right wing for incoming passengers and left wing for outgoing. Parking area features covered sidewalks. Special air cargo building at extreme right is one of two planned. Twenty-six-finger layout is planned for expandability.

Dallas opens new \$7.5-million air terminal

Airlines this week were scheduled to transfer operations to the fabulous, spacious new \$7.5-million terminal building at Dallas' Love Field.

Six times as big as the antiquated terminal just vacated, the new building features single-level operation with 375,000 sq. ft. of space throughout. Twenty-six gate positions are provided, 10 more than in the old building.

The new terminal is expected to produce \$861,645 in revenue in 1958, going over \$1 million by 1960. Concess-

Spacious ticket counter space is provided in long right-wing corridor as first step in separated passenger-flow arrangements. Left-wing houses self-service baggage area, leading to surface transportation and rent-a-car services.



sionaires alone have spent \$1 million in finishing off their own space.

Modern features of the new building: air conditioning right into the fingers; moving sidewalks from lobby to three loading piers; automatic doors; self-service baggage claim; directional-flow passenger traffic; accessibility of all services; covered walks to parking areas.

Functional design was based on opinions of air travelers gathered by Aviation Director George Coker and his staff.

Mammoth lobby—separating incoming and outgoing passenger wings—boasts 27,750 sq. ft. of space. Concessions are placed within this area for maximum public convenience. Balcony leads to observation area and restaurant space.



Two-way moving sidewalks extend from lobby area about 250 ft., leading to each of three loading piers. Probably first used in a major airport, sidewalks will save passengers' time.



ANOTHER
FIRST
FROM
TEMCO



*Temco's target drone "Teal" takes to the air
to sharpen aim of Navy pilots*

The XKDT-1, "Teal," designed and developed by Temco as a low-cost, expendable target system, recently made its initial flight to become the nation's first successful rocket-powered target drone. Carried aloft and launched by an F3H-2M Demon fighter at 20,000 feet, the "Teal" held a straight course for almost eight minutes . . . the first flight of such duration for a drone using solid-propellant fuel. Also, the event was the first successful controlled launching of such a device from swept-wing aircraft.

Capable of operating near the speed of sound at altitudes up to 50,000 feet, the "Teal" will serve as a target for

air-to-air missiles and other defensive devices carried by Navy aircraft. It is a Temco development from initial concept to flight readiness, and an outstanding example of Temco's engineering and production capabilities.

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BOOKS

Man Unlimited: Technology's Challenge to Human Endurance. By Heinz Gartmann. Translated from the German by Richard and Clara Winston. Pantheon Books, New York. 214 pages. Price, \$4.50.

Semi-technical text which tells part of the story of man's attempt to survive in the environments he is creating for himself. The author asks whether man's physical equipment is able to withstand the stresses imposed by high accelerations and decelerations, extreme heat and cold, weightlessness and radiations unshielded by the earth's atmosphere.

Gartmann concludes from the many case histories given in the book that man is neither a poorly constructed machine nor a deluded lunatic, grasping beyond his reach. He explains that "man is merely following his innate instinct to explore and experiment to the limits of his capacity, and it so happens that we are of an era when he takes his most spectacular strides."—W. B.

The Airman's World. By Gill Robb Wilson. Random House, Inc., New York, and Random House of Canada, Limited, Toronto. Price, \$2.95.

In prose and verse with photographs, the book describes the world of the air as seen by the flier and how flying changes one's outlook.

Technical literature

"Performance in Sequencing Aircraft for Landings as a Function of Control Time Availability." Part I of "Human Engineering Aspects of Radar Air Traffic Control." L. M. Schipper, Ohio State Univ., and OSU Research Foundation, for WADC. Feb. 1956. 19 pages. 50 cents. (Order PB 121524 from OTS.)

Results of tests on problems in simulated radar control of air traffic showed specifically that four inexperienced controllers were as efficient in guiding aircraft in sequence to a hypothetical ground controlled approach gate within the critical four minutes available to them as when eight minutes were available.

"Analysis of the Thermal Properties of Plastic Laminates, Cores and Sandwich Panels," R. F. Trapp, WADC. Jan. 1957. 18 pages. 50 cents. (Order PB 121-882 from OTS.)

Data on thermal properties of several plastic laminates, foam cores and sandwich panels.

"Simulation Study of Control of an Aircraft at or Near the Absolute Ceiling." A. C. Robinson, J. W. Early, and B. J. Doody, WADC. Mar. 1956. 57 pages. \$1.50. (Order PB 121459 from OTS.)

From the standpoint of accuracy, controls using airspeed information were found considerably more effective than those using information on altitude, pitch angle, and angle of attack in this simulation study of controlling and maintaining a B-45C aircraft at its absolute ceiling.

ADVERTISERS INDEX

Air Associates, Inc.	48
Air Carrier Service Corp.	63
AiResearch Mfg. Co., Div.—Garrett Corp.	10
Allison Div., General Motors Corp.	60
Bendix Aviation Corp., Scintilla Div.	12
Braniff International Airways, Inc.	49
Bulletin Board (Classified)	68
Canadair Ltd.	18
Cannon Electric Co.	6
Champion Spark Plug Co.	55, 56, 57, 58
Chandler-Evans	24
CONVAIR—A Div. General Dynamics Corp.	1
Curtiss-Wright Corp.	25
Dallas Airmotive, Inc.	16
Flightex Fabrics, Inc.	35
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Hamilton Standard Div., United Aircraft Corp.	71
Hardman Tool & Engineering Co.	2
Jeppesen & Company	61
Lockheed Aircraft Corp.	31
D. Napier & Son, Ltd.	50
Narmco Resins & Coatings Co.	23
John Oster Mfg. Co., Avionic Div.	13
Pacific Airmotive Corp.	61
Phillips Petroleum Co.	72
Puritan Compressed Gas Corp.	11
Robinson Aviation, Inc.	3
Rolls-Royce, Ltd.	43
Rotol Ltd.	62
Temco Aircraft Corp.	67
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Vickers Inc., Div. Sperry Rand Corp.	17
Vickers-Armstrong (Aircraft) Ltd.	36, 37
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MISSILE WEEK: Weekly newsletter written for top executives, technical management in industry and government concerned with the missile and rocket field. Subscriptions: \$50 a year, postpaid, U.S. Possessions and Canada.



EN ROUTE

by Wayne W. Parrish

A peek into darkest Australia

HAVE YOU EVER FLOWN 1,670 miles just to see what the interior of a country looked like? Well, I did—in Australia. I flew to a town called Alice Springs.

Larger than the continental United States, Australia is mostly desert or ranching country, like some of the western U.S. The vast bulk of the nine million population is in the extreme southeast corner near the big cities of Sydney, Melbourne and Adelaide. Along the east coast there is a population fringe dominated by the important city of Brisbane and on the southwest coast there is another population area dominated by Perth.

Elsewhere the population is sparse or nonexistent. In the very heart of the country is Alice Springs, connected with Adelaide by a railroad that has a passenger train once a week, and with the north by a thousand-mile highway built during World War II through awfully sparse country. In the past 20 years Alice Springs has jumped from 400 to 3,200 population. I thought I ought to see a real pioneering town and so I did.

In order to get there I had to fly from Sydney to Melbourne, spend the night and pick up a Trans-Australian Airlines DC-4 next morning and fly to Adelaide, about 400 miles, and then on up to Alice Springs, 835 miles. In Melbourne I was met by AMERICAN AVIATION's able correspondent, R. N. Hughes-Jones, and John Lower, the live-wire Qantas manager, and taken to the good (but not cheap) Plaza Hotel to get some sleep for a dawn awakening.

To save time next morning I took a taxi to the airport instead of checking in at the downtown terminal, but I could have gotten in some more sleep. The TAA plane turned out to be three hours late, due to cargo, so I had plenty of time to drink Espresso coffee at the terminal (best coffee in Australia) and watch the handing of other flights.

The more I saw of passenger handling the more impressed I became. As in Sydney, each airline has its own terminal in Melbourne. The bulk of checking in is performed in downtown terminals and the buses are timed to arrive a few minutes before plane departure, just enough time to get baggage loaded. There is almost complete absence of confusion at the airport, no long check-in lines, and paper work has already been performed. Passengers spend the bare minimum of time at airports except when there's a plane delay.

My DC-4, a once-a-week flight on this particular schedule, had only 32 seats, the entire forward area being set aside for cargo. At Adelaide there was a shortened stop because of the delay and off we went to the north over country which soon became desert. Lots of colors, as one finds in any desert area, but treeless and desolate.

It was a four-and-a-half-hour flight without seeing any signs of civilization

over most of it. Late in the afternoon we came in on a good surfaced runway at Alice Springs and I was pleased to see a few trees. The town itself was hidden by a couple of small treeless ranges. On the airport were a few wooden buildings and a parked USAF Fairchild Packet.

Bush flies pesty

As I stepped out of the plane I had my first introduction to the Australian bush fly. I had heard about these pests but had no idea there were so many of them. The bush fly resembles the American house fly but it is only half or maybe a third as big. It clings and it bites. There must be at least 56 billion per square mile. The backs of people are pretty well covered black as they walk along and you either spend your time waving flies away from your face or, as the permanent population has learned, you pay no attention to them and let them crawl over your face.

I stepped inside the small terminal, which had a snack bar, hoping to escape the flies while waiting for my bag, but there were just as many inside the building. Most of the people standing around seemed to pay little attention to them but to a city bird like me they were the worst pest I've ever encountered. I never saw any evidence of using aerosol bombs to keep them out of buildings and I guess this would be useless. A spraying job by air would be an enormous project and possibly wouldn't kill off the flies in any case. (But TAA could certainly use a bomb or spray inside the cabins after take-off—the flies followed us all the way back to Adelaide.)

So I was in the interior of Australia, a real frontier town, so to speak. I took the TAA station wagon into town along with a couple of German passengers and went to the Alice Springs Hotel, where I had a room reserved. Many of the streets were unpaved, the place was quite dusty, it was warm (but not hot) and I began feeling glad that I had a seat back to Adelaide the next afternoon.

The Alice Springs Hotel is not one of the world's fine hosteries, but you can get by. My room was small, poorly furnished, poorly lighted, with a combination shower and toilet. The dining room was plain but the food, although likewise plain, was ample, although without much choice. (This isn't a complaint—they do very well, everything considered.)

Heat is terrific

To give you an idea of what Alice Springs is like, just read this: In the summer of 1956 it had 116 days of temperatures above 100 degrees Fahrenheit. Four people perished in the out-country from being stranded. They were burned to death by the sun. Driving in the out-country can be very hazardous; a human being burns to death in three hours of

direct sun. Fortunately for me, I was there in March, which was early fall "down under" and the major heat season had departed.

Despite the flies and the heat, Alice Springs is becoming a tourist center. Within the area are some beautiful natural wonders, the kind we find in our west. It takes some arranging to see them, but there are now regular tours available.

And let me tell you that Alice Springs has one of the most beautiful churches in the world. It's a memorial and was designed by a bloke by name of Philpott of Adelaide. It is one of the most delightful and ingeniously designed buildings I've ever seen. Everything else in the town is quite ordinary and sun-baked and dusty, but the church is magnificent. As an example, you cross a bridge over a lily pond to reach the main entrance.

An artesian well supplies the town; if it ever stops, the population had better get out fast or it'll burn up. A new hotel was started some years ago but stopped before being completed for lack of money. A good air-conditioned hotel probably could do very well.

'Secret' USAF base

One of the biggest surprises I got was to find more Americans in the hotel than Aussies. Seems that the Fairchild Packet I saw at the airport had arrived on a supply and inspection trip from Guam so there were a dozen or so USAF uniforms in evidence. I asked one of the birds what they were doing in Alice Springs and got a vague answer meaning that it was a secret.

Well, like so much of the military stuff, what sort of a secret? It didn't take long to find out that USAF has a unit based down there. Let's say it is for weather reporting purposes. In a town of 3,200 you can't make such a mystery out of a base like that without stirring up more mystery, but it's no secret that Australia has a missile base at the south end of the desert and that there are all manner of tracking and other operations to be performed. In any event my uniformed colleagues from the U.S.A. were hobnobbing and talking with the local people but thought I was a very suspicious character—except for two pilots who were knowledgeable and friendly guys.

There isn't much to do in Alice Springs. There is a corner ice cream parlor and grocery store. There is an open-air movie across from the hotel. And on the second floor of the hotel is an outside terrace and small bar with a very poor selection of drinks except for the one item found everywhere in Australia—high-powered beer. It's a lonely life in the town but Alice Springs is a strategic communications and transportation point in the vast interior and undoubtedly will grow in size and importance.



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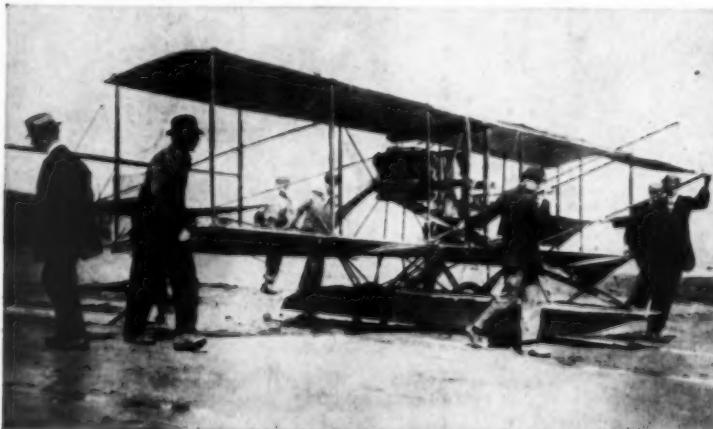
The Many-Sided Career of Early Bird Robinson



Building this 30 h.p. plane in 1908 led to Robinson's meeting with Glenn Curtiss and a long association with this great aviation pioneer.



This early sport plane, designed and built in 1915 by Robinson, attained 81 m.p.h., weighed only 600 pounds.



Hugh Robinson (far left) at the launching of an early Curtiss hydroplane at San Diego in 1911. Glenn Curtiss, designer, is at far right.

Hugh Robinson's skill as a flyer was enough to win him lasting aviation fame; but when you add his abilities as a designer and builder of aircraft, you complete the picture of a many-talented man.

Robinson built a one-cylinder automobile in 1896, a dirigible in 1906 and a tractor-type monoplane in 1908. This airplane led to his meeting Glenn Curtiss. For many years afterward, Robinson helped Curtiss design, build and fly the early and famous Curtiss aircraft.

Robinson was a famous early-day exhibition flyer, making more than 900 appearances here and abroad. He was among the first to fly air mail, making a mail run between Minneapolis and Rock Island, Ill., in 1911. He demonstrated a pioneer dive bombing technique with grapefruit "bombs" in California; operated a flying school in France, and built a sport plane that weighed only 600 pounds.

Altogether, Robinson flew more than 3,000 hours in compiling a useful and enviable record as a daring and resourceful airman.

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